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ABSTRACT

This document describes aspects of the Small Area Forecast (SAF) process, from the preparation of policy alternatives to measures to provide for evaluation. The three principle areas discussed are: (1) the six alternative sets of public policies which might be followed in the Southeast region of Michigan for meeting population needs in the areas of employment, education, housing, land use, and holding capacities between now and the year 2000; (2) the forecasts of households, population, employment, and land use at the small area level through the year 2000 which flow from the policies; and (3) fiscal and environmental impact measures for each of the forecasts which permit evaluation of policy outcomes. Numerous tables of data are included. (Author/EB)

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ABSTRACT

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ABSTRACT:

This document contains the results from all aspects of the Small Area Forecast effort. The three principal areas discussed are: (1) The six alternative sets of public policies which might be followed in the region, (2) The forecasts of households, population, employment and land use at the small area level through the year 2000 which flow from the policies, and (3) Fiscal and environmental impact measures for each of the forecasts which permit evaluation of policy outcomes.

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Third Edition

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SMALL AREA FORECASTS:
POLICIES, RESULTS, AND EVALUATION

August, 1978

by

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PREFACE

The Council's need for a set of Small Area Forecasts arises from the necessity to have a single, consistent set of forecasts for all areas of planning. The future distribution across the region of households, population, employment and land use forms the basis for plans in the areas of housing, transportation, recreation and open space, land use, water quality management and criminal justice.

The basic forecasting mechanism which the Council has used in the past was developed under the Transportation and Land Use Study (TALUS) program in 1969. Several modifications to those forecasts were made during the early 1970s based on the availability of 1970 Census data, revised regional forecasts which substantially reduced the expected regional population, and a revised sewer service map. Through all of these revisions, the underlying forecasting mechanism remained the same.

Several events came together in 1975 which suggested that the time had come for the creation of a completely new set of forecasts. First, the feeling existed that the regional forecast of 6.1 million people in the region by 1990 was too high. Second, the availability of complete 1970 Census data provided the opportunity to take more recent events into account than the 1953-1965 time series data used in the TALUS work. Third, support for new forecasts had been received from the County Planning Directors of the region, with particular emphasis on the analysis of alternatives which had not been available in earlier forecasts. Finally, the Water Quality Management Program which was newly under way both required and provided the means to prepare a new set of forecasts.

This document describes all aspects of the Small Area Forecast process, from the preparation of policy alternatives to measures to provide for their evaluation.

Too many persons and organizations have contributed to the completion of this process to name individually. However, special recognition should be given to the County Planning Directors and their staffs for participation in the Technical Working Group (TWG). Meeting regularly for almost two years, this group formulated the policy alternatives which are the backbone of the alternative forecasts. Through their efforts, detailed expressions of local policy have been achieved which will help ensure the utility of the forecasts.

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CHAPTER I

INTRODUCTION

CHAPTER I: INTRODUCTION

OVERVIEW OF THE REPORT

The process of developing a new set of Small Area Forecasts (SAF) began formally in November of 1975, more than two years ago. In the intervening period a combination of staff members, consultants, and Council committees have performed and reviewed technical work. This report is the culmination of the effort, presenting information regarding how the forecasts* were prepared, the forecast results themselves, and evaluation measures which will assist policy makers in evaluating the six policy alternatives.

A wide range of topics will be discussed to accommodate readers who have had varying levels of involvement with the SAF process in the past. The introduction briefly describes the groups who were involved and how they related to each other, and provides a general introduction to the structure and methods behind the forecasts. The information contained in the introduction will be most useful to those who are being newly introduced to SAF.

The second chapter describes the rationale behind analyzing alternatives. It points out the difference between an attempt to predict the future and an ability to influence the future with available public policy options.

The third chapter discusses the model* that forms the foundation of the forecast for each policy alternative. Only one model is used, and it is the same for all alternatives. Consequently, differences in results are due to the different public policies that each alternative represents. The non-technical reader may wish to skip this portion of the report.

Chapter IV presents the consistent theme, or overall intent, behind each policy alternative. These policies were formulated by the Technical Working Group (TWG), and have been brought before Council committees for review. Final approval was given by the Council's Executive Committee for the six policy alternatives which are presented here. This chapter will summarize the results of discussions held concerning the policy alternatives over the past two years. It will provide the reader with an understanding of how the alternatives differ conceptually from each other.

Chapter IV is also more specific. For the first time, policy differences in the alternatives will be presented as they have been translated into numerical inputs for the SAF model. The actual household holding capacities* of sewer extensions and redevelopment projects scheduled for each alternative are presented, together with the amount of environmentally sensitive land* that is protected and the vacant acreage zoned for each of five land use classes. Policy differences are also discussed in terms of their expected impact on the forecast results.

---

*Words with asterisks are defined in the Glossary.

The forecast results for each alternative are presented in Chapter V. The level of detail used is intended to facilitate understanding of the regional impacts of the policies and their forecast implications. Since the policies expressed in a single alternative are consistent throughout the region, similar results tend to be seen in communities which have similar characteristics, regardless of their location in the region. A grouping of communities has been developed to assist in understanding these relationships, and is described in Appendix A. Appendix B contains the household and population results at the Minor Civil Division (MCD) level. Some additional detailed community group and county level summary tables are included in Appendix C.

Finally, a series of evaluation measures is presented in Chapter VI. By themselves, the measures will not distinguish whether one alternative is "better" than another. Rather, they provide information regarding the expected consequences of following a set of policies which would result in the forecasts as presented. The judgment regarding which alternatives are better will be made by Council policy bodies, utilizing the evaluation measures. Examples of the measures included in the chapter are public capital costs for schools and sewers; private capital costs for sewers, water lines and local roads; acres of environmentally sensitive land converted to developed land uses; pollution loads on water and air; and indices of energy usage.

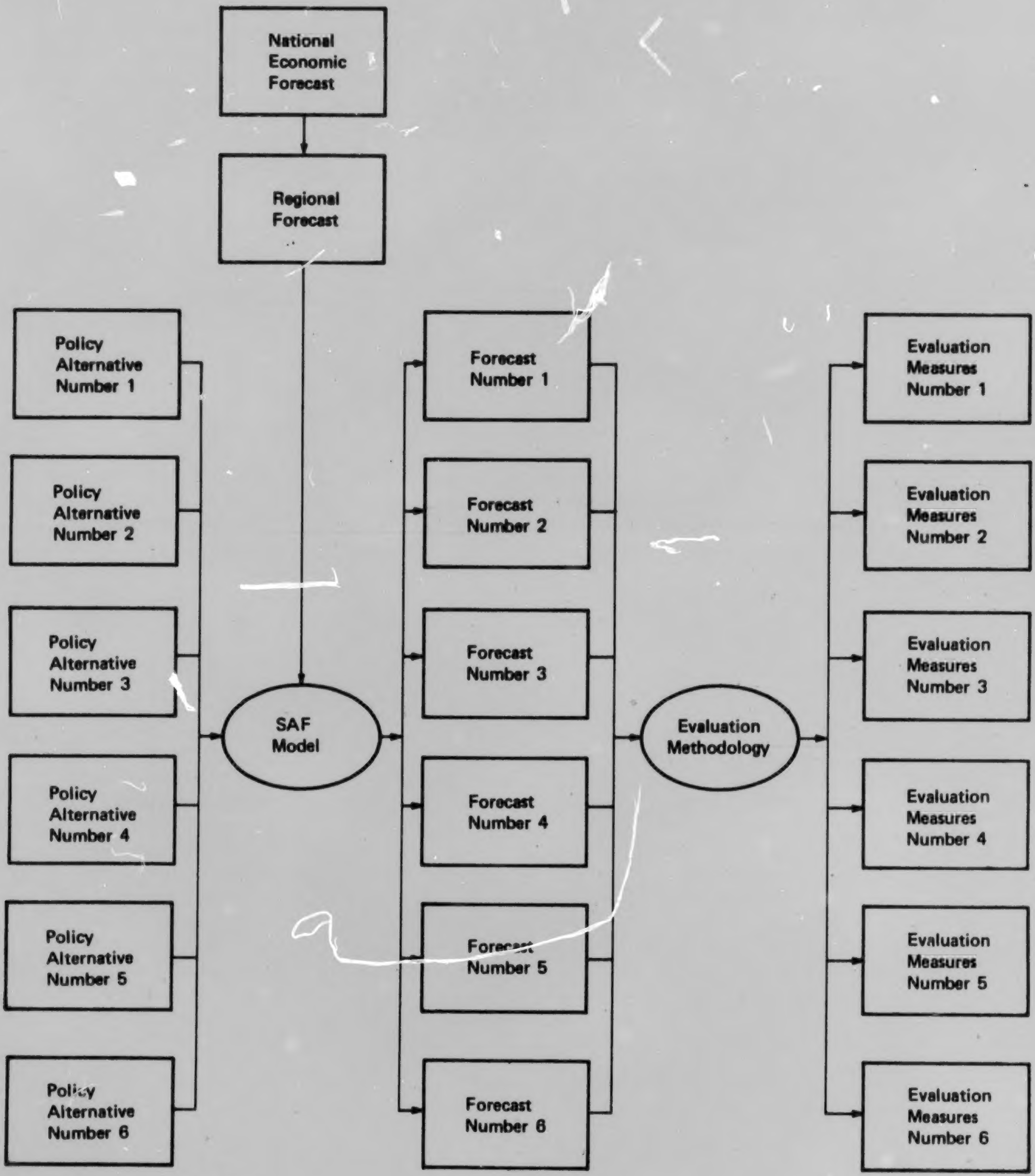
The level of detail used throughout the report is designed to assist the forecast policy adoption process. For those who are interested, additional technical background material describing the forecast models, development of policy alternatives and evaluation methodologies will be made available as separate documents. In addition, the SAF model has generated substantially more detailed information then is presented here. More information may be obtained through specific requests to the Council.

TOTAL SAF STRUCTURE

The alternative forecasts result from the interaction of a series of forecasting models with six alternative sets of public policies which may be followed between now and the year 2000 in the Southeast Michigan region. Figure I-1 shows how these various elements relate to each other.

Beginning at the top of the figure, the first element is a forecast of the national economy.[1] This element is important, because it forms the context in which all other changes take place and may have a substantial effect on Southeast Michigan. For example, durable goods are extremely important to Southeast Michigan. If the national economy shifts away from production of these goods, the regional population will probably be lower by the year 2000 than would be the case if such production were to increase.

FIGURE I-1
ELEMENTS OF SMALL AREA FORECASTS STRUCTURE


National Economic Forecast
Regional Forecast
Policy Alternative Number 1
Policy Alternative Number 2
Policy Alternative Number 3
Policy Alternative Number 4
Policy Alternative Number 5
Policy Alternative Number 6
SAF Model
Forecast Number 1
Forecast Number 2
Forecast Number 3
Forecast Number 4
Forecast Number 5
Forecast Number 6
Evaluation Methodology
Evaluation Measures Number 1
Evaluation Measures Number 2
Evaluation Measures Number 3
Evaluation Measures Number 4
Evaluation Measures Number 5
Evaluation Measures Number 6

Taking the structure of the national economy in the year 2000 as given, all regions in the United States are in competition with one another for population and jobs. A second model was utilized to forecast total population, jobs, and other socio-economic factors for Southeast Michigan in five-year increments through the year 2000. It made use of the national forecast, and forecasted the status of all regions in the country by five-year intervals. Dr. Curtis Harris, of the University of Maryland, executed this model under contract with the Council.

The regional forecast* from the Harris model was adopted by the Council's Executive Committee in February of 1977 for use in the SAF process. A description of the models and the forecast, together with supporting information used for adoption is contained in two background papers, Regional Forecasts, Southeast Michigan, published in February, 1977, and A Review of Methodologies to Produce Regional Projections and Forecasts, published in November, 1976.

As can be seen in Figure I-1, a single regional forecast is used as input for all SAF alternatives. The six alternative forecasts are formed by using six different sets of local public policies as inputs to the SAF model. The function of the SAF model is to distribute the total number of households, people and jobs specified by the regional forecast across the seven-county region. Local public policies as expressed in the policy alternatives do not affect the regional total. Rather, they influence where residential and non-residential activities are distributed throughout the region.

Thus, each policy alternative has a corresponding forecast associated with it. The differences between the alternatives are caused by different policies regarding sewer extensions, zoning, density, protection of environmentally sensitive land, highway and transit development, and redevelopment of existing built-up land. The components of the different policies are explored in detail in subsequent chapters, and are related to the resulting forecasts.

To assist in evaluating each alternative, an evaluation methodology was developed. The methodology transforms the policy assumptions and resulting forecasts into measures of consequences which would likely be associated with each set of forecast results. Examples of the measures are estimates of public capital costs for schools and sewer lines; private capital costs for sewers, water lines, and local roads; acres of environmentally sensitive land converted to developed land uses; pollution loads on water and air; and indices of energy usage. By themselves, the evaluation measures will not decide whether one alternative is preferable to another. Indeed, each alternative is likely to have some desirable and some undesirable aspects. The decision regarding the most desirable alternative is a policy decision to be made by the Council's policy makers. The policy descriptions, the forecasts, and the evaluation measures are all information which will assist in that decision making process.

DEVELOPMENT OF SAF

A substantial number of people have taken part in the development of the Small Area Forecasts (see Figure I-2). Each group has played a different, but complementary role. At the left of the figure the groups that were responsible for the development of the policy alternatives are shown. To ensure adequate representation and expression of local public policies, the Technical Working Group (TWG) was formed in January, 1976. The membership of TWG was drawn from all county planning staffs, the City of Detroit, and the Michigan State Department of Highways and Transportation.

In conjunction with Council staff, TWG met regularly through the fall of 1977 to draw up the policy alternatives, define how the policies would be expressed in specific terms for model input, and code* the input data.[2] TWG also received presentations on the status of the model development work and suggested several modifications which were incorporated into the model. Finally, TWG engaged in detailed review of model output forecasts as they were produced. All of these efforts were reported to the Council on Regional Development on a regular basis by a TWG representative.

Development of the computer forecasting model took place in parallel with TWG's policy efforts. The task was performed primarily by Council staff, although invitations were issued for participation by local technical staff; one person from the staff of the City of Detroit worked as part of the team for several months. The Council also contracted with several consultants[3] to assist in the conceptual formulation of the model. Model development work was completed in July, 1977. Since that time staff has concentrated on actual production of the forecasts utilizing the model and the TWG policy alternatives. All forecasts were completed in January, 1978.

The third "arm" from the left on Figure I-2 shows the regional forecast process. As previously noted, the regional forecasts were obtained from a consultant, Dr. Curtis Harris of the University of Maryland.

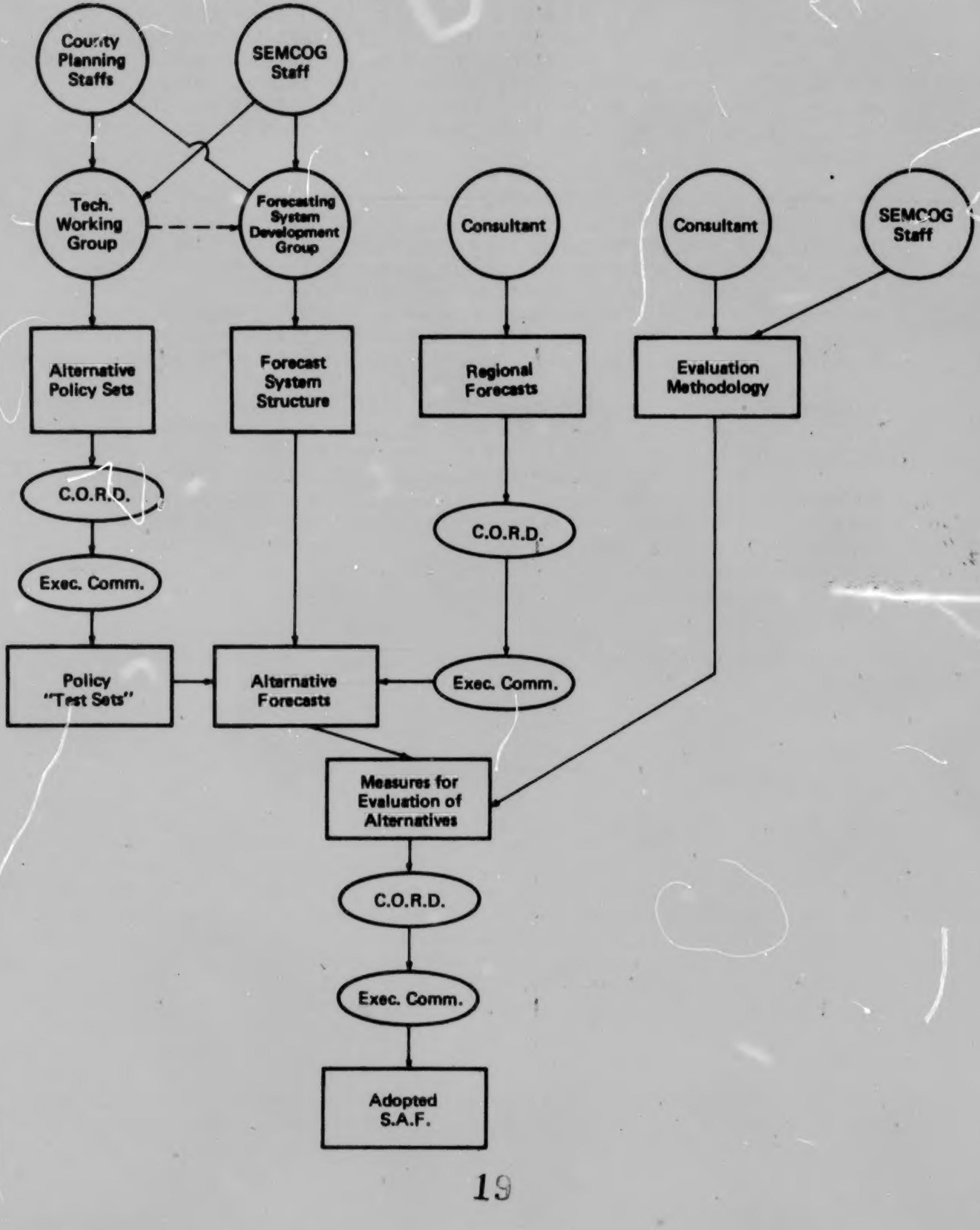
Continuing to the right side of the figure, the evaluation methodology was to have been developed exclusively under contract.

However, a satisfactory conclusion to the contract has not been reached in time to assist in the production of this report. Accordingly, Council staff has developed a simplified set of evaluation measures. Much of the information is of the same type as the contractor will provide, but the techniques are simpler and more straightforward, lending themselves to hand rather than computer calculations. The disadvantage of the techniques is that they are less accurate in an absolute sense than more sophisticated methods. Even so, it is felt that they are both adequate and appropriate for assessing relative impacts of different alternatives. In this context, the evaluation measures should be used only to compare alternatives.

In conclusion, these separate chains of activity come together in this document containing policies, forecasts, and evaluation measures. In

FIGURE I-2

GROUP INVOLVEMENT IN SMALL AREA FORECASTS


County Planning Staffs
SEMCOG Staff
Tech. Working Group
Forecasting System Development Group
Consultant
Consultant
SEMCOG Staff
Alternative Policy Sets
Forecast System Structure
Regional Forecasts
Evaluation Methodology
C.O.R.D.
Exec. Comm.
C.O.R.D.
Policy "Test Sets"
Alternative Forecasts
Exec. Comm.
Measures for Evaluation of Alternatives
C.O.R.D.
Exec. Comm.
Adopted S.A.F.

some ways, a great deal of information is contained here, which will require a substantial effort for the reader to assimilate. In other ways, the complexity inherent in the implications of alternatives for regional development suggests that much more information could be produced. Hopefully, this document provides sufficiently detailed information to assist in the policy bodies' difficult task of choosing a SAF alternative.

FOOTNOTES: CHAPTER I

[1] The national forecast* was produced by the Almon Model, developed by Dr. Clopper Almon at the University of Maryland.

[2] Technical Report, "Methodology for Coding Development Alternatives", December, 1977.

[3] The consultants included:
Dr. Allan Feldt, University of Michigan
Dr. J. Royce Ginn, National Bureau of Economic Research
Dr. Stephen Putman, University of Pennsylvania
Dr. Ira Robinson, University of Calgary
Dr. Wilbur Steger, CONSAD Corporation

CHAPTER II

THE PURPOSE OF ALTERNATIVE FORECASTS

CHAPTER II: THE PURPOSE OF ALTERNATIVE FORECASTS

The Small Area Forecast (SAF) process differs from traditional forecasts in that it produces six alternative futures rather than just one. This approach offers several advantages in exchange for the additional effort required to produce more than one forecast. In this chapter, these advantages will be discussed in comparison with those offered by other forecasting techniques.

All forecasting involves use of knowledge about past behavior projected into the future in some fashion. The simplest techniques merely project* recent trends in the events to be forecasted into the future. For example, the average annual population change in an area over the last 10 years could be projected to continue for the next 20 years. Techniques of this sort work well enough in the short run, but tend to be less useful over a long time period because trends change, and public policies may shift to meet changing conditions.

More complex models, such as the SAF model, can adjust trends over the forecast period* through feedback mechanisms*. A simple example of such capability would be an area currently growing very rapidly which runs out of land in 1980. Since the SAF model maintains a land accounting system, growth would stop in the area when land had been used up and would shift to another area where land was available. This represents an example of the "behavior" of the regional system which should be modified over time by a model,rather than utilizing a simple projection of trends. The SAF model contains a variety of such feedback mechanisms to alter current or recent past trends.

The formulation of local public policies is another aspect of the behavior of the total regional system. The outcome of policy formulation clearly has an effect on the system, yet it is difficult to predict. Mathematical formulas have limited ability to represent the outcome of political debates to extend or not extend sewers, to redevelop or not redevelop central city areas, to protect or not protect sensitive environmental land. Often no attempt is made to account for the political process in a forecasting model.

If a single forecast is prepared without a political/policy formulation sub-model, the forecaster is left with two choices. First and most frequently, no mention is made of the topic. This option assumes implicitly that the policies which have been followed in the past will continue into the future. In the short run this may not be a bad assumption. However, over the period of 30 years from 1970 to 2000 encompassed in the SAF, it has obvious weaknesses.

A second possibility for a single forecast is to build the mathematical portion of the model to be sensitive to policy considerations, and then make a series of assumptions regarding the course of future policy changes. The principal disadvantage of this approach is that it assumes the ability of a single person, committee, or whoever is made responsible, to accurately predict the shape of future public policy. Since many policy choices are available, different individuals or groups will probably have differing views regarding which policies are likely to be adopted.

In either of the cases noted above, a rather deterministic view of the future is implied. The question of the impact of public policy on the future of the region is posed in a different fashion by the SAF process of examining alternative forecasts. The SAF process has proceeded on several key assumptions.

1. Public policies toward sewer extension, land use and zoning, environmental protection, redevelopment, transportation systems, etc., are important in shaping the future of both the region as a whole and local areas within the region.

2. A variety of policy options are available which might be followed. These may be different from policies followed in the past.

3. The decision regarding which options are most desirable is a political one and should be made explicitly by policy making bodies --- not implicitly by a mathematical model or by technical staff.

4. The policy options can be arranged into unified, consistent themes which are expressed as coded inputs to which the model is sensitive.

Thus, as the process has developed, no single forecast is the "right" or most accurate one. The alternative forecasts represent possible futures for the region, based upon the policy assumptions which lie behind them. Their purpose is to provide useful information for deciding which alternative policies are the most desirable. The remainder of the SAF process consists of reaching that decision at the policy making level with the aid of this report.

CHAPTER III: INTRODUCTION TO THE MODEL SYSTEM

MODEL OVERVIEW

The plans being developed by the Council require a forecast by small areas of the future number of households and residents, the number of employees in several industrial and commercial sectors, and the amount of land expected to be used by each of these activites. Use of a single set of forecasts for transportation, environmental, housing, and land use planning helps to ensure consistency among these plans. The Small Area Forecast (SAF) model system has produced six distinct forecasts, based on alternative public policies which might be followed in the region. From the alternative forecasts, one will be chosen to be used as the basis for Council planning efforts.

As noted in Chapter I, a single model is used for all forecast alternatives. The differences between the alternative forecasts are due to the different public policies which lie behind each alternative. Thus, the SAF model is sensitive to public policy changes.

The SAF model is used in conjunction with a regional forecasting model. The regional forecasts are used as "control totals"* to assure that reasonable small area forecasts are produced. Regional control totals are necessary because over a 30-year forecast period, the population of the region as a whole is substantially influenced by national economic factors which are outside the scope of local policies within the region. These larger economic factors, together with national trends toward smaller household sizes, control the total pool of population and jobs available to locate within the region in ways that are largely outside the control of local public policy.

Once the outside parameters of regional forecasts and expression of public policy have been determined, the SAF model distributes the population, jobs and resulting land use throughout the region. In doing so, it does not simply use past trends projected into the future to determine the future growth or decline of an area. It also incorporates many complex relationships among factors which accelerate or slow rates of decline and growth.

These relationships which influence the location of employment and households are established statistically utilizing 1965 and 1970 data. When incorporated into computer programs, the relationships can be used to forecast the location of employment and households through the year 2000 within the constraints and opportunities of local public policy.

The forecasts are made in five-year increments through the year 2000, beginning with 1970 as the base year and 1975 as the first forecast year. The results as forecasted for 1975 are then used as the base year for a forecast of 1980. This iterative process -- that is, forecasting the next five-year time period from a base time, and then using the forecasted status as the base for the subsequent forecast period -- is performed six times. There is one forecast iteration for each five year period from 1970 to 2000.

At each iteration, the model remains the same, but the inputs change. As an illustration, consider the 1985-1990 forecast period. To operate properly, the model must have base data* for 1985, the public policies to be followed during the 1985-1990 period, and the regional forecast for households, population, and employment for 1990.

MODEL STRUCTURE

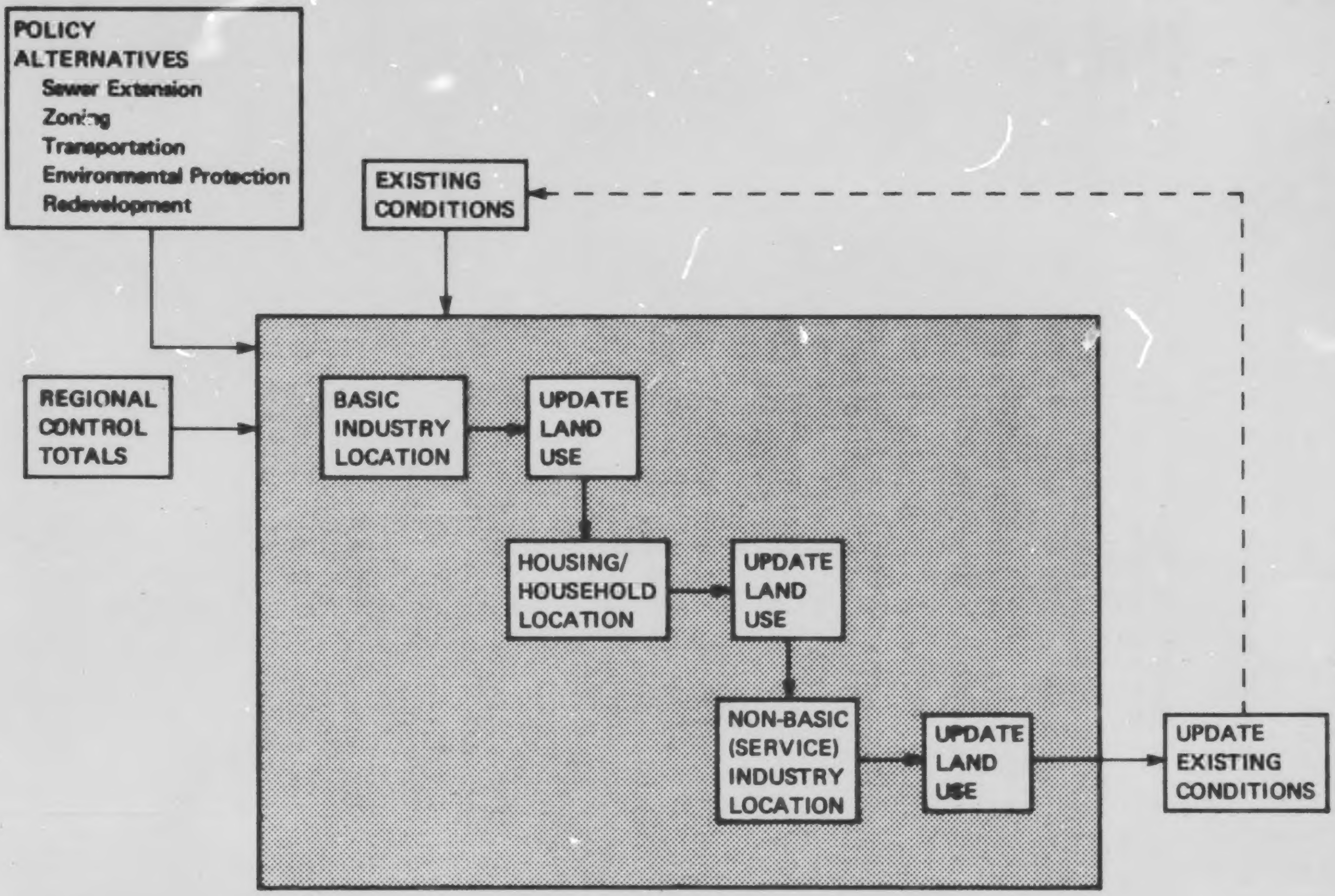
A generalized flow diagram of the SAF model is presented in Figure III-1. It is composed of two primary parts. The grey shaded area represents the model itself, broken down into a schematic version of its sub-components. The boxes outside the grey area are outside the model and represent model inputs and outputs. As previously mentioned, the box at the bottom right of the figure represents the outputs, which become the inputs for the next time period.

The model operates as follows for each five-year forecast period;

> First, the regional forecasts and the policy information are prepared for the appropriate time period, together with the base conditions of population, households, employment and land use at the beginning of the forecast period.
>
> Second, the locational distribution of employment by small area in the automobile and manufacturing industries -- called "Basic Industries" -- is determined. Land use changes resulting from the conversion of vacant to industrial land are made.
>
> Third, the locational distribution of households and the associated number of residents by small area are determined. Land use changes resulting from the conversion of vacant to residential land are made.
>
> Fourth, the locational distribution of employment in the commercial and service industries by small area is determined. These industries -- called "Non Basic" industries -- include businesses such as grocery stores, gas stations, banks, etc. Land use changes resulting from the conversion of vacant to commercial/industrial land are made.

Three important constraints are placed on the completion of each of the last three steps. The first is related to the location of new households

FIGURE III-1
SMALL AREA FORECASTING SYSTEM


POLICY ALTERNATIVES
Sewer Extension
Zoning
Transportation
Environmental Protection
Redevelopment
EXISTING CONDITIONS
REGIONAL CONTROL TOTALS
BASIC INDUSTRY LOCATION
UPDATE LAND USE
HOUSING/ HOUSEHOLD LOCATION
UPDATE LAND USE
NON-BASIC (SERVICE) INDUSTRY LOCATION
UPDATE LAND USE
UPDATE EXISTING CONDITIONS

THE GRAY AREA IS THE SAF MODEL

or employment. Neither can be located in an area where there is no appropriately zoned vacant land, as defined by the policy alternative in use. For example, commercial employees cannot be placed in an area where all land is zoned for residential or agricultural purposes, nor can households be placed on land zoned commercial or industrial. The policy alternatives, and hence the zoning patterns, change from one alternative to another.

The second constraint requires that the number of households in a small area shall not exceed the household holding capacity* of the available land which is calculated based on the quantity of land available and the permissible density assigned by the policy alternative. Similarly, the number of employees in a small area must not exceed the employment capacity* of the area. The derivation of holding capacities is discussed in detail in Chapter IV. By this method, attractive areas of the region will not continue to grow endlessly over time.

The third constraint, as previously noted, is that the sum total of all households or employees in all small areas must equal the regional forecast total. After initial allocations are made to the small areas by the model, this necessary equality is checked. Reallocations are made until the sum of the small areas equal the regional total.

FUNCTIONING OF MODEL SUBCOMPONENTS

As noted above, the model contains three primary subcomponents or modules. They are the Basic Industry module, the Household module, and the Non-Basic Industry module. Each module has the same general functional structure.

1. For each small area, the holding capacity and the employment capacity are calculated from the vacant land (including redevelopment land) and associated zoning and density categories from the policy specifications for the area.

2. The number of employees or households desiring to move into that area is determined by use of mathematical equations. In this step, each small area is actually competing with all other areas for a portion of the regional forecast total. Some areas will be more attractive than others; these areas will tend to grow toward their capacity. Other areas will be less attractive, and either stabilize or decline. Because attractiveness is determined for every five-year period, an area can be attractive for one or two periods, then gradually become less so, finally even declining somewhat. The reverse is also true.

3. Once the number of households or employees desiring to move into each area has been determined, this number is compared to the area's holding capacity. If the number exceeds the holding capacity, the excess is reallocated to other areas. A final reallocation is made to ensure conformance with the regional forecast total.

When these three steps have been completed for a module, the next module is executed. A forecast for a given period is complete when all three modules have been executed.

DEFINITION OF SMALL AREAS

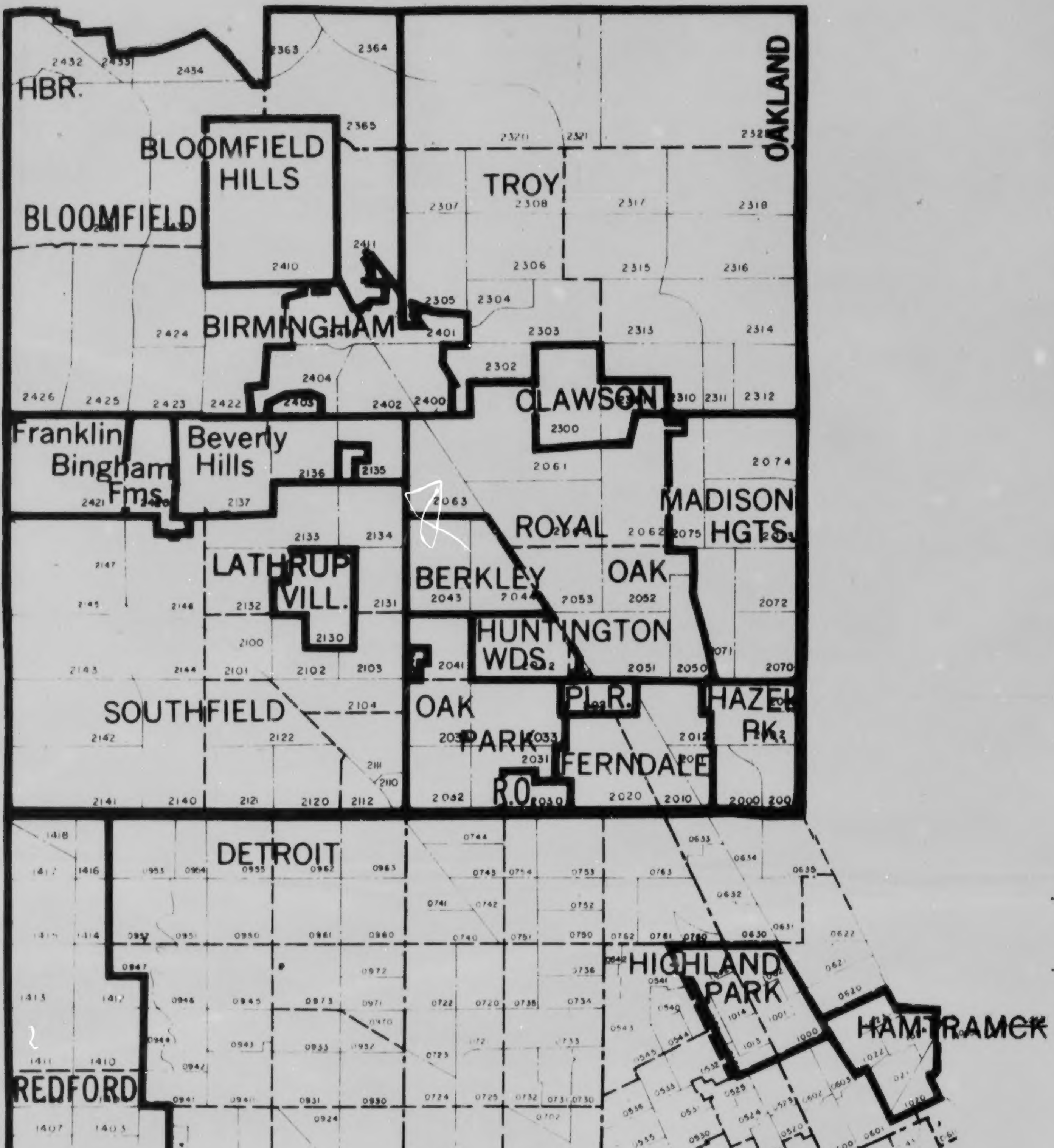
The "small areas" referred to in the SAF title correspond to a level of geography which has been used by the Council for analytical purposes since the late 1960's. They are called analysis zones, or simply "zones." Figure III-2 is a map of a selected number of zones in northern Wayne and southern Oakland counties. There are 1446 zones in the seven-county region.

When the zones were developed they corresponded roughly to United States Bureau of the Census tract boundaries. Census boundaries have been redefined over time but zone boundaries have remained stable to ensure the ability of the Council to maintain comparable data over time. Originally, the zones were designed to contain roughly equal population. This meant that they were small in geographic size in urban areas with dense populations and large in rural areas where the population was sparse. Since the zone boundaries have remained the same while population shifts have occurred, they no longer contain roughly equal populations.

Almost all work inside the model takes place at the zone level. For this document, most of the zone level results have been aggregated to Minor Civil Division, County and Community Group level. This has been done to reduce the sheer volume of numbers to be considered, and because policy considerations do not, for the most part, require such highly detailed results. With few exceptions, zone boundaries correspond directly to Minor Civil Division boundaries; thus, only minor inaccuracies have been introduced in the process of summarizing the results.

FIGURE III-2

SELECTED ZONES AND MINOR CIVIL DIVISIONS


HBR.
BLOOMFIELD HILLS
BLOOMFIELD
BIRMINGHAM
TROY
OAKLAND
CLAWSON
Franklin
Bingham Fms.
Beverly Hills
ROYAL
OAK
MADISON HGTS.
LATHRUP VILL.
BERKLEY
HUNTINGTON WDS.
SOUTHFIELD
OAK PARK
PL.R.
HAZEL PK.
FERNDALE
R.O.
DETROIT
HIGHLAND PARK
HAMTRAMCK
REDFORD

CHAPTER IV: POLICY INPUTS

INTRODUCTION

Public policies concerning urban development ultimately concern land specifying how land is to be used and improved by the public and private sectors. Zoning and land use controls, capital improvement programs, transportation plans, urban redevelopment, and policies designed to protect environmentally sensitive land from development comprise a substantial portion of the public policies governing urban development. It is through these instruments that public bodies influence future development.

In order to build local public policies into the Small Area Forecast (SAF) process six policy alternatives addressing each of the policy areas mentioned above were developed by the Technical Working Group (TWG). Each of the alternatives was developed thematically, and then translated into SAF model input. Together they represent a wide range of policy options, from scenarios that impose few constraints on development to those that substantially restrict development. The titles of the policy alternatives are;

Alternative 1:	Local Plans, Modified by Trends in Local Policy Changes
Alternative 2:	Local Plans, Modified by Strong Resource Conservation Policies
Alternative 3:	Local Plans, Modified by County Plans and/or Policies
Alternative 4:	Market Forces, Unrestrained
Alternative 5:	Local Plans, Unmodified
Alternative 6:	Local Plans, Modified by Adopted SEMCOG Policy Recommendations

The policies will be referred to by their alternative numbers in subsequent discussions.

POLICY FACTORS

This section will present the major public policy factors used by TWG to develop the alternatives. Three different areas of policy decisions were incorporated, including:

1. Vacant land, and its planned future use, including zoning regulations, new sewering, density requirements, and total or partial protection or preservation
2. Urban redevelopment plans
3. Transportation networks.

Vacant Land and Zoning

The amount of vacant land in each community in 1970 was determined from aerial photos. In addition to the total amount of vacant land, its cover, or type, was determined. Land was classified into one of the following types:

Water Related:	Floodplains
	Wetlands
	Shores
Agricultural:	Active, high potential[1]
	Active, low potential
	Not active, high potential
Other:	Woods
	Steep slopes (greater than 12%)
	Other

The total amount of vacant land in 1970, and its type, was held constant for all alternatives. That is, each alternative started with identical amounts of vacant land, with identical amounts of it in each type.

Within the common framework of total vacant land and land type, the future land use, or zoning, varied from one alternative to another. The total amount of vacant land in each zoning class for each alternative is given in Table IV-1. The differences in zoning policies between the alternatives is readily apparent.

Sewering

The next factor which determines the future development of an area is whether or not it will be sewered, and if it will, when that sewering will occur. The extension of sewers is, of course, an important public policy decision. The amount of land sewered, and the date sewered, for each alternative is given in Table IV-2. Again, there are major differences between the alternatives.

Holding Capacity

An important question associated with the decision to extend sewers into an area is what density of development will be permitted. A vacant area's *maximum* potential for residential growth is measured by its *holding capacity*. The holding capacity is calculated by multiplying the available

TABLE IV-1

1970 VACANT LAND BY LAND USE CLASS (IN ACRES)

	Alternative					
Land Use Class	1	2	3	4	5	6
Residential	1173149	159631	771381	1285914	1090106	642421
Commercial-Institutional	167901	61597	122838	530086	176787	109821
Industrial	39267	46123	80447	182292	105280	66349
Recreational	102085	92956	106119	162865	84922	98099
Agricultural	679588	1801683	1081205	833	704895	1245300
TOTAL	2161990	2161990	2161990	2161990	2161990	2161990

TABLE IV-2

1970 ACRES SERVED BY PROPOSED SEWER EXTENSIONS BY SEWER SERVICE PERIOD

Sewer Service Period	Alternative					
	1	2	3	4	5	6
1970	175572	204843	176822	190977	189274	176780
1975	88667	66057	95189	1971013	109652	98535
1980	130147	20373	92660	0	104819	103316
1990	57984	0	64042	0	151533	0
TOTAL	452370	291273	428713	2161990	555278	378631

vacant acres zoned for residential use by the maximum permitted density of development:

Density X Acres = Holding Capacity

Density is measured in dwelling units per acre, and holding capacity is thus expressed in terms of dwelling units (Units).

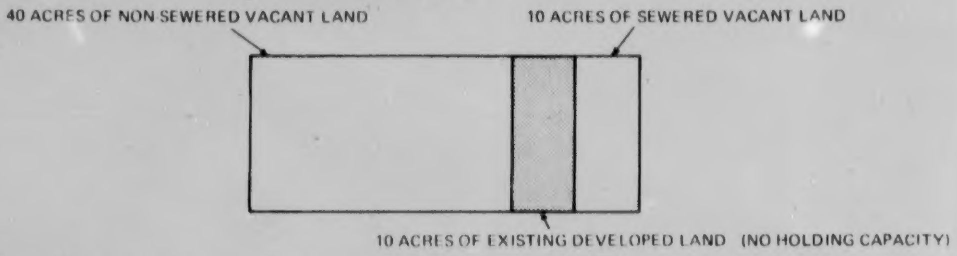
In addition, the SAF model assumes that each occupied dwelling unit contains one household. Thus, the holding capacity can also be thought of as the maximum number of households which can move into a vacant area of land, based on the permitted density in the zoning category. In the remainder of the document, holding capacities refer to either dwelling units or households, depending on the context.

The foregoing discussion has been about sewered holding capacity; that is, the holding capacity of vacant sewered land. Vacant areas which are not sewered during the forecast also have permitted density ranges, although the permitted densities tend to be much lower than in areas served by sewers. The calculation is the same -- acres times density. The results are referred to as non-sewered holding capacity.

Areas which are already fully developed -- that is, they contain no vacant land -- are not considered to have holding capacity in their developed state.

To summarize, holding capacity is a concept applied only to vacant land. The sum of sewered plus non-sewered holding capacity is total holding capacity, measured in dwelling units or households. When holding capacity is used without specifying a sewer designation, it means total holding capacity.

The diagram below represents a hypothetical zone comprised of 10 acres of existing developed land and 50 acres of vacant land zoned for residential use. Ten of the 50 vacant acres are sewered, with a permitted density of four dwelling units per acre.


40 ACRES OF NON SEWERED VACANT LAND
10 ACRES OF SEWERED VACANT LAND
10 ACRES OF EXISTING DEVELOPED LAND (NO HOLDING CAPACITY)

The other 40 vacant acres are not sewered. Since new houses here would require septic systems, fewer houses can be built. In this example, the maximum allowable density of these 40 acres is 1.0 dwelling unit per acre. The holding capacity of the 10 sewered vacant acres is:

$$10 \text{ Acres} \times 4.0 \ \frac{\text{Dwelling Units}}{\text{Acre}} = 40 \text{ Dwelling Units}$$

This is sewered holding capacity. The holding capacity of the 40 non-sewered acres is:

$$40 \text{ Acres} \times 1.0 \, \frac{\text{Dwelling Units}}{\text{Acre}} = 40 \text{ Dwelling Units}$$

This is non-sewered holding capacity. Thus the total holding capacity of the zone is 80 dwelling units or households.

Protection Policies

Public policies may be used to reduce the amount of certain types of land available for development. These policies are referred to as protection policies, and land so removed is called protected land. Two situations may require the use of protective policies:

1. A land type, such as active cropland, grass lands, or woods, may be felt to be so important that development of it should be prohibited.
2. Certain lands, especially flood plains, wetlands, shores, and steep slopes, are unsuitable for development, and hence restrictions on its use may be implemented.

Protection policies are implemented in Alternatives 1, 2 and 6. The amount of protected land in each alternative is given in Table IV-3. Protection of land reduces an area's holding capacity, since less land is available for development.

Sewered and non-sewered holding capacities in each alternative for 1975 are given below. They reflect all zoning plans, new sewer service areas, density requirements, and protection policies contained in the different alternatives. A single set of holding capacities was used for the period 1970-1975, which reflected the policies in place during that period. Implementation of alternative policies was assumed to begin in the 1975-80 Forecast period.

	Alternative					
	1	2	3	4	5	6
Sewered	1006721	1104534	914835	9001162	1045119	738572
Non-Sewered	325550	85458	134613	0	351723	278548
TOTAL	1332271	1189992	1049448	9001162	1396842	1017120

Redevelopment

Redevelopment is another major area for public policy decisions. Providing for land use changes in built-up areas of the region increases the potential of the older urban areas. Like plans for vacant land, redevelopment policies vary with the different alternatives. Some alternatives permit any proposed redevelopment to take place, others allow

TABLE IV-3

PROTECTED LAND BY LAND TYPE

(In Acres)

Land Type	Alternative 1	2	3	4	5	6
Water-Related	154903	169332	0	0	0	168146
Other Sensitive	59193	255773	0	0	0	121827
Agriculture	283123	1233979	0	0	0	590606
TOTAL	497219	1659084	0	0	0	880579

only those plans or projects which have existing funding or commitments for funding. Table IV-4 shows the holding capacity that could be generated by redevelopment in each forecast year for each alternative.

Transportation Networks

Highway and transit construction is another public policy factor which influences the growth of an area. Highway networks were established for each alternative by TWG. The highway networks are based on the 1974 Transportation Improvement Plan. The networks represent the highway system as it would appear in each of the forecast periods from 1970 to 2000. Figure IV-1 presents the networks by alternative.

Transit ratios were established for each alternative to determine transit accessibility. These measures reflect increased accessibility for those areas with existing or proposed transit service in those alternatives with such service.

CODING PROCEDURES

TWG representatives developed thorough procedures to translate written public policies and maps into numeric data for input into the SAF model. These procedures are called coding; a detailed discussion is contained in the Methodology for Coding Development Alternatives (December, 1977).

Local development plans and policies, such as zoning ordinances, density requirements, and proposed sewer extensions, were used as the base for the policy coding. Thus, Alternative 5, Local Plans, represents the basic development policies, and the other alternatives represent modifications of these policies. TWG used local plans as a base for two reasons:

1. Local plans or zoning ordinances are available for most communities in the region

2. Local plans can be easily coded or quantified for input into the model

Alternatives 3, 5 and 6 are based on the written plans or policies of the counties, local communities, and the Council, respectively. In many cases, maps reflecting these policies are available. Alternatives 1, 2 and 4 represent either current trends in the implementation of local plans, or the more extreme development policies potentially available to public officials.

DEVELOPMENT OF COMMUNITY GROUPS

To aid in presenting and interpreting the SAF alternatives, a grouping of communities into seven categories has been developed. The derivation

TABLE IV-4

POTENTIAL REDEVELOPMENT HOLDING CAPACITY BY YEAR
(In Dwelling Units)

Year	Alternative					
	1	2	3	4	5	6
1975	14998	15948	15289	11907	15289	15289
1980	31090	53298	40129	1260	40129	40129
1985	21161	50958	47227	500	47227	47227
1990	27830	43898	35151	71	35151	35151
1995	23772	30905	44735	71	44735	44735
2000	29547	42329	32003	71	32003	32003
TOTAL	148398	237336	214534	13880	214534	214534

FIGURE IV-1

FREEWAY ADDITIONS

Construction Date*	ALTERNATIVE					
	1	2	3	4	5	6
1975	I-696 from Telegraph to I-94					
1980						
1985	M-53 M-21 M-275	M-21	M-53 M-21 M-275	M-53 M-21 M-275 NWstern	M-53 M-21 M-275	M-53 M-21
1990	M-59		M-59	M-59	M-59	
1995				Davison/ Mound E-W Connector		
2000						

*Indicates Date Construction is Begun

M-21: West from Port Huron through St. Clair County
M-53: From I-696 to 18 Mile
M-59: East from Mound Road to I-94
M-275: From I-96 to I-75
NWstern: Northwestern Highway from I-696 to M-275
Davison/Mound: Davison from the Lodge to I-696
East-West Connector: South of Metropolitan Airport, from I-275 to I-75

of this grouping is presented in more detail in Appendix A. Communities within each group have some similar characteristics based on 1970 data. Since the policies expressed in a single alternative are consistent throughout the region, similar results tend to be seen in communities which have similar characteristics, regardless of their location in the region. In this grouping, cities and villages are grouped separately from townships. Within the cities and villages, they are grouped according to population and percent "built-up", which is a measure of how fully developed the community was in 1970.

Group 1 consists of populous cities with relatively little remaining vacant land which could be developed.

Group 2 consists of populous cities which still have a significant amount of vacant land that could be developed.

Group 3 consists of less populous cities and villages with relatively little remaining vacant land which could be developed.

Group 4 consists of less populous cities and villages which still have a significant amount of vacant land that could be developed.

Within the township groups, communities are grouped by population and sewered holding capacity in 1970, which is a measure of how much investment in sewers existed at the beginning of the forecast process.

Group 5 consists of townships which are populous, regardless of other characteristics.

Group 6 consists of less populous townships without significant investments in sewer in 1970.

Group 7 consists of less populous townships which had significant sewer investments in 1970.

The group to which a community is assigned in no way affects the results for the community. It is simply a display device applied to the results after they are produced, to assist in understanding the results at a regional scale.

THE ALTERNATIVES

Each alternative represents a unified set of development policies available to public officials. These policies are used to implement the objective or intent of the alternative.

Alternative 1, Local Plans, Modified by Trends in Local Policy Changes, is an attempt to project current practices in the implementation of the local plans and policies coded for Alternative 5. The objective is to see what effects these current trends might have on future land use patterns and the distribution of households and employment.

The trends represent a combination of available data, capital expenditure time schedules for local communities, and local knowledge of development patterns. The trends reflect reductions in some of the proposed sewer extensions called for by local plans, since many communities find they do not grow as rapidly as initially expected. they also reflect moderate protection policies in regards to sensitive land.

The objective of Alternative 2: Local Plans, Modified by Strong Resource Conservation Policies, is to contain development within existing urbanized areas in order to maximize use of existing urban infrastructures, protect sensitive land, and reduce public service and utility costs. The public policy factors are coded appropriately: new sewer extensions are limited to committed projects, no development is allowed on any sensitive lands, urban redevelopment is accelerated, highway construction is cut back, and transit construction is accelerated.

These policies are intended to severely restrict growth in existing undeveloped areas, and turn current patterns of urban sprawl back into existing developed areas. This would result in more efficient use of public facilities.

Alternative 3: Local Plans, Modified by County Plans and/or Policies, represents a written policy alternative. This alternative uses local plans, except when that community's county plan is different; the county's plans are used in these instances. Since each county plan is unique, distinct coding procedures were developed for the county plan maps of Monroe, St. Clair and Washtenaw. Livingston and Oakland Counties developed procedures for coding their county land use policy text. Macomb and Out-Wayne Counties use unaltered information coded for Alternative 5.

The development philosophy of Out-Wayne and Macomb Counties is to support the policies of their local communities, which are generally supportive of growth. The philosophies of the other counties call for moderate preservation policies: revitalization of older urban areas and conservation of sensitive land types. Instead of directly applied protection policies, however, very low maximum densities were used.

Alternative 4: Market Forces, Unrestrained, represents development as it might occur if there were no restraints due to public policies. The objective is to allow the dynamics of an unconstrained market to determine the distribution of households and employment in the region. To remove holding capacity constraints, the entire region is hypothetically sewered by 1975 and a minimum density of eight dwelling units per acre required. Moreover, only committed redevelopment projects are coded; no sensitive land is protected; highway development is accelerated; and transit development de-emphasized.

The lack of policy constraints is likely to spur movement out of existing urban areas into the newer urban and rural areas of the region. This requires major extensions of infrastructure.

Alternative 5: Local Plans, Unmodified, allows for the development potential indicated by the local plans. The maximum allowable density in specified zoning categories and master plans is coded; if the local plan called for sewers in a specific area, the area is sewered; local redevelopment plans are coded; and no sensitive land types are protected.

Local plans are generally supportive of growth. As such, they tend to continue or accelerate current patterns of urban sprawl.

Alternative 6: Local Plans, Modified by Adopted SEMCOG Policy Recommendations, reflects a moderate preservation philosophy. The 1990 Land Use Policy Plan is the primary source for this alternative. The policies attempt to preserve the existing urban infrastructure and to conserve sensitive land types. The preservation policies, however, are not as stringent as those assumed in Alternative 2. All other coded inputs reflect this moderate preservation theme inherent in SEMCOG policies.

The intent of these policies is to decelerate urban sprawl, revitalize existing urban areas, and increase utilization of existing and proposed transit networks, thereby reducing public service and utility costs.

Comparison of the Alternatives

Tables IV-5 and IV-6 present holding capacities in 1975 of proposed sewer extensions and non-sewered areas, respectively, for each community group. Total holding capacities are presented graphically in Figure IV-3. Tables IV-7 and IV-8, and Figure IV-2 present similar information for each county. The holding capacities reflect all zoning plans, new sewer service areas, density requirements, and protection policies contained in the different alternatives. As an example of how to read these tables, consider Table IV-5: Group 1 communities have a proposed sewered holding capacity of 96,335 new dwelling units in Alternative 1. This represents 9.57 per cent of the total proposed capacity of 1,006,721 new units for all groups in the alternative.

Sewered holding capacities range from 738,572 units in Alternative 6 to over 9 million units in Alternative 4. Alternatives 1, 2, 3 and 5 each have approximately 1 million units. Alternative 2, with its strong preservation policies and restricted sewer extensions, has the highest of these four. This is because the minimum allowable density in this alternative is eight dwelling units per acre; this relatively high density permits very efficient use of existing and proposed sewer systems. In contrast, densities in Alternative 5 can be as low as two dwelling units per acre.

Non-sewered holding capacities range from 0 in Alternative 4 (which assumed all land is sewered in 1975) to 351,723 in Alternative 5. The effects of protection policies in non-sewered holding capacities are easily seen: Alternative 2, with 100 per cent protection, has a capacity

TABLE IV-5

1975 HOLDING CAPACITY OF PROPOSED SEWER EXTENSIONS BY COMMUNITY GROUP (IN DWELLING UNITS)

(Percentage Distribution is Given in Parentheses)

Community Group	Alternative					
	1	2	3	4	5	6
Group 1	96335 (9.57)	97819 (8.86)	88100 (9.63)	89265 (0.99)	89155 (8.53)	88373 (11.97)
Group 2	169775 (16.86)	229104 (20.74)	136346 (14.90)	274665 (3.05)	143497 (13.73)	138176 (18.71)
Group 3	2308 (0.23)	3221 (0.29)	2334 (0.26)	5009 (0.06)	2735 (0.26)	2118 (0.29)
Group 4	69931 (6.95)	89751 (8.13)	55398 (6.06)	162659 (1.81)	57779 (5.53)	46458 (6.29)
Group 5	280863 (27.90)	353168 (31.97)	251076 (27.44)	931543 (10.35)	301645 (28.86)	224127 (30.35)
Group 6	60394 (6.00)	51365 (4.65)	39128 (4.28)	5389852 (59.88)	93267 (8.92)	23480 (3.18)
Group 7	327115 (32.49)	280106 (25.36)	342453 (37.43)	2148169 (23.87)	357041 (34.16)	215840 (29.22)
REGION	1006721 (100.00)	1104534 (100.00)	914835 (100.00)	9001162 (100.00)	1045119 (100.00)	738572 (100.00)

TABLE IV-6

1975 NON-SEWERED HOLDING CAPACITY BY COMMUNITY GROUP (IN DWELLING UNITS)

(Percentage Distribution is Given in Parentheses)

Community Group	Alternative 1	2	3	4	5	6
Group 1	70 (0.02)	92 (0.11)	60 (0.04)	0 (0)	72 (0.02)	62 (0.02)
Group 2	292 (0.09)	938 (1.10)	425 (0.32)	0 (0)	148 (0.04)	279 (0.10)
Group 3	1 (0)	2 (0)	1 (0)	0 (0)	1 (0)	8 (0)
Group 4	4443 (1.36)	2742 (3.21)	3393 (2.52)	0 (0)	5471 (1.56)	5096 (1.83)
Group 5	25173 (7.73)	14750 (17.26)	14037 (10.43)	0 (0)	16634 (4.73)	23764 (8.53)
Group 6	233220 (71.64)	52035 (60.89)	83901 (62.33)	0 (0)	261421 (74.33)	191095 (68.60)
Group 7	62351 (19.15)	14899 (17.43)	32796 (24.36)	0 (0)	67976 (19.33)	58244 (20.91)
REGION	325550 (100.00)	85458 (100.00)	134613 (100.00)	0 (0)	351723 (100.00)	278548 (100.00)

FIGURE IV-2
TOTAL VACANT HOLDING CAPACITY IN 1975 BY COUNTY AND ALTERNATIVE

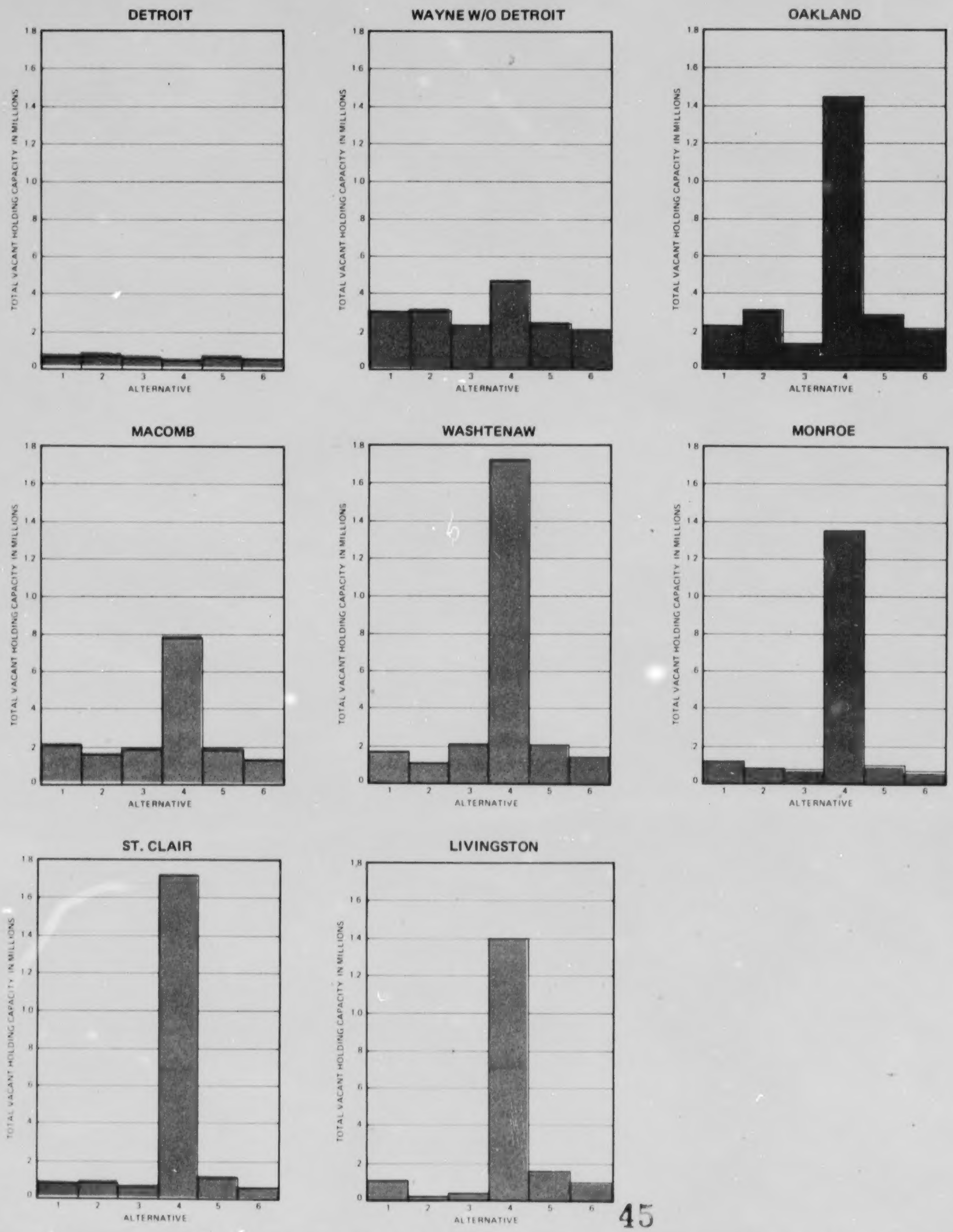


TABLE IV-7

1975 HOLDING CAPACITY OF PROPOSED SEWER EXTENSIONS BY COUNTY (IN DWELLING UNITS)
(Percentage Distribution is Given in Parentheses)

County	Alternative 1	2	3	4	5	6
Detroit	64712 (6.43)	69079 (6.25)	64186 (7.02)	58041 (.64)	65068 (6.23)	64995 (8.80)
Out-Wayne	301487 (29.95)	314249 (28.45)	237386 (25.95)	479298 (5.32)	238387 (22.81)	210826 (28.55)
Oakland	155092 (15.41)	262088 (23.73)	92866 (10.15)	1456631 (16.18)	215482 (20.62)	127911 (17.32)
Macomb	199110 (19.78)	165465 (14.98)	187293 (20.47)	787498 (8.75)	187033 (17.90)	126909 (17.18)
Washtenaw	124604 (12.38)	116111 (10.51)	193999 (21.21)	1726628 (19.18)	141694 (13.56)	110489 (14.96)
Monroe	92019 (9.14)	83779 (7.59)	54288 (5.93)	1362269 (15.13)	64861 (6.21)	45873 (6.21)
St. Clair	49976 (4.96)	77876 (7.05)	66180 (7.23)	1725904 (19.17)	83527 (7.99)	35437 (4.80)
Livingston	19723 (1.96)	15884 (1.44)	18636 (2.04)	1404892 (15.61)	49062 (4.69)	16131 (2.18)
REGION	1006723 (100.00)	1104531 (100.00)	914834 (100.[illegible])	9001161 (100.00)	1045114 (100.00)	738571 (100.00)

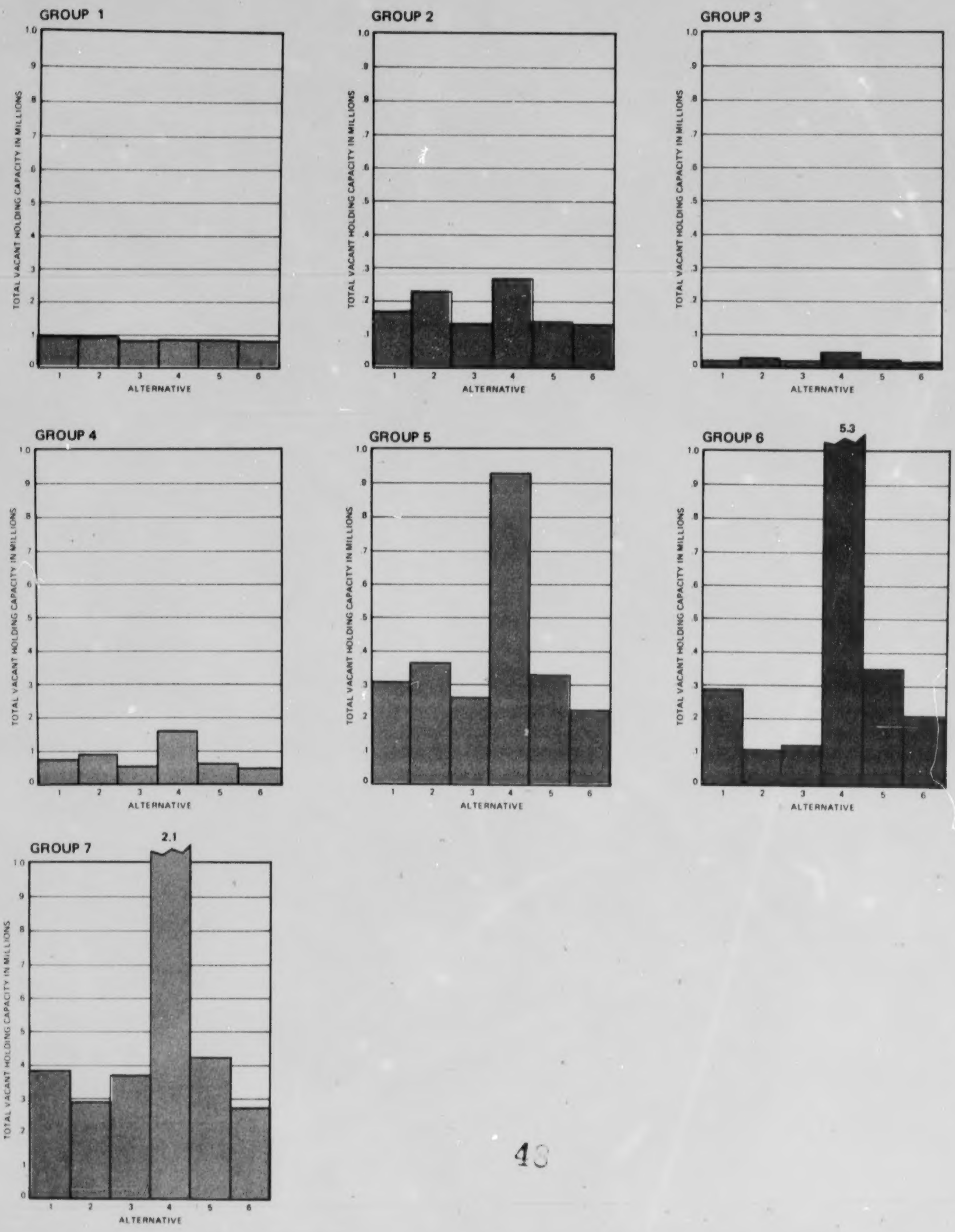
TABLE IV-8

1975 NON-SEWERED HOLDING CAPACITY BY COUNTY
(Percentage Distribution is Given in Parentheses)

County	Alternative 1	2	3	4	5	6
Detroit	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Out-Wayne	2104 (.65)	187 (.22)	2039 (1.51)	0 (0)	2007 (.57)	3008 (1.08)
Oakland	84862 (26.07)	61697 (72.20)	48855 (36.29)	0 (0)	80042 (22.76)	94343 (33.87)
Macomb	8465 (2.60)	8388 (9.82)	9947 (7.39)	0 (0)	9902 (2.82)	10537 (3.78)
Washtenaw	57519 (17.67)	837 (.98)	16189 (12.03)	0 (0)	65425 (18.60)	38613 (13.86)
Monroe	42262 (12.98)	1537 (1.80)	29413 (21.85)	0 (0)	36060 (10.25)	21732 (7.80)
St. Clair	33059 (10.15)	8242 (9.64)	6102 (4.53)	0 (0)	37567 (10.68)	25088 (9.01)
Livingston	97279 (29.88)	4570 (5.35)	22068 (16.39)	0 (0)	120720 (34.32)	85229 (30.60)
REGION	325550 (100.00)	85458 (100.00)	134613 (100.00)	0 (0)	351723 (100.00)	278550 (100.00)

FIGURE IV-3

TOTAL VACANT HOLDING CAPACITY IN 1975 BY COMMUNITY GROUP AND ALTERNATIVE



of 85,458 units; Alternative 1, with 25 per cent protection of water-related sensitive lands only, has a capacity of 325,550 units; Alternative 5, with no protection, has a capacity of 351,723 units. Alternative 3 uses no protection policies, but instead uses very low densities to reduce development of sensitive land. It has a non-sewered holding capacity of only 134,613 units.

The intent of the alternatives with regard to new sewer extensions can best be seen at the community group level (Table IV-5). For example, Group 2, populous cities which are not fully developed, has a capacity of 274,665 units, or 3.05 per cent of the total, in Alternative 4. However Alternative 2, with its strong policies for maximizing the use of existing infrastructures, has a smaller capacity, 229,104 units, representing over 20 per cent of the available total. Conversely, Group 6, less populous townships with little or no sewered holding capacity in 1970, generally has capacities of less than 60,000 units. However, in Alternative 4, which effectively removes sewering constraints, this group has a capacity of almost 5.4 million units.

Chapter V will discuss the results of each alternative, and how those results relate to the policy inputs. Chapter VI provides information regarding the costs associated with these policies.

FOOTNOTES: CHAPTER IV

[1] High potential refers to potential agricultural yield, not potential for development.

CHAPTER V: RESULTS

REGIONAL RESULTS

This chapter presents the results from the six policy alternatives for households and population, school-age children, employment, land use, and holding capacities. Comparisons of the results are made at the county level and at the community group level.

To adequately understand and evaluate the results, it is necessary to understand the major demographic and employment shifts the nation as a whole is currently undergoing. The Small Area Forecast (SAF) model, and hence its results, reflect these shifts through use of the regional model, as discussed in Chapter III. The three most important shifts are:

1. A dramatic drop in the average number of persons per household between 1970 and 2000.
2. A rise in the number of jobs in the so-called "service" sectors, such as health care professionals, repairmen, domestic workers, etc.
3. A rise in the number of jobs per capita.

Regional results for population and households are presented below, along with the average number of persons per household:

	1970	2000
Population	4,725,311	5,226,335
Households	1,422,635	2,098,930
Persons per Household	3.32	2.49

This reflects the fall in the nation-wide birthrate and the trend toward more one- and two-person households. One- and two-person households accounted for 52.1 per cent of all households in 1970; by the year 2000 they will represent 62.8 per cent. In Southeast Michigan, this trend has two important consequences:

1. Existing urban areas can remain "full", in the sense that all houses are occupied, yet they could lose a considerable portion of their population, since the average household size in those houses decreases.

2. The per cent of school-age children in the population drops, from 28.9 per cent in 1970 to 22.4 per cent in 2000. This has serious consequences for many school districts, especially those in existing urban areas.

Employment results for the alternatives are presented at the county level. Two categories will be analyzed: Basic Industry, comprised of the auto industry and all other manufacturing sectors, and Non-Basic Industry, comprised of all other sectors. The regional results for each are presented below.

	1970	2000
Basic	658,425 (38%)	774,749 (34%)
Non-Basic	1,071,726 (62%)	1,488,009 (66%)
Total	1,730,151 (100%)	2,262,758 (100%)

The most important trend evident is the relative growth of the non-basic sector, from 62 per cent in 1970 to 66 per cent in 2000. This reflects the trend toward a "service" oriented economy, in part due to an increasingly automated and computerized society, and also to the larger proportion of the population, especially senior citizens, who are not working, but still consume services.

The rise in the average number of jobs per capita is another national trend reflected in the regional results. Some of this increase is due to the entrance of more women into the job market, particularly as increasing numbers of families find it difficult to maintain their standard of living on only one income. The regional average number of Basic jobs per capita is given below:

	1970	2000
Basic Jobs/Capita	.139	.148
Non-Basic Jobs/Capita	.227	.285

The rest of the chapter is devoted to a presentation and comparison of the results from each alternative.

HOUSEHOLDS AND POPULATION

Introduction

This section discusses how each SAF alternative affects the distribution of households and population in the region. The principle policy factor that influences residential location in the model is the manner in which land is made available for development. Three elements of land use control are particularly important. The first is the total amount of land that is allowed to become developed. This amount varies among the alternatives according to the amount of environmentally sensitive land that is protected from development. The second is the density at which new development is allowed to occur, which controls the total number of households that may locate in a particular community. This amount is essentially the residential holding capacity of the community, a concept introduced in Chapter IV. Finally, the distribution of holding capacity among the minor civil divisions in the region is most important. If some MCD's have relatively more holding capacity than others, they will have more room for growth and will tend to grow more.

The results are presented first by the community groups defined in Appendix A. These groupings provide a means to examine how demographic trends in existing urban areas relate to similar trends in other areas with the region. Such information indicates the degree growth is concentrated in existing urbanized areas, and how much it is spread into the more rural areas of the region. For the purposes of this analysis, Community Groups 1, 2, 3, and 5 may be considered to represent the existing urbanized area at the beginning of the forecast. These groups include the more populous cities and townships in the region as well as the older, almost fully developed smaller cities that cluster around the city of Detroit. The remaining groups are the less populous towns and townships that are scattered throughout the rural areas in the region, to the north, west and southwest of Detroit.

The results are then presented at the county level in a similar fashion. Out-Wayne, Oakland, and Macomb counties presently are more urbanized than the others in the region, and are discussed as a group. The remaining counties are also quite similar in terms of urbanization, and they are also discussed as a group. Again, it will be useful to consider how growth is distributed among the two groups under each alternative.

Households and Population Among the Community Groups

Table V-1 presents the number of households that reside in each community group in the year 2000, by alternative. The base figures for 1970 are presented along with the percentage change from 1970 to 2000 to aid comparison of the alternatives. For example, the number of households in Community Group 2 increased 59 per cent under Alternative 1 from a base of 234,990 in 1970 to a total of 373,852 in 2000. An identical format is used in Table V-2 to present the population results for these community groups.

Although the number of households in the region increases 48 per cent from 1970 to 2000, the number of households in the Group 1 cities declines under all alternatives. The decline is minimal under Alternatives 1, 2, 3, and 6. These are the alternatives with policies which tend to direct growth into existing urbanized areas. For these alternatives the decline ranges from less than half a per cent under Alternative 3, to just over four per cent under Alternative 2. Alternatives 4 and 5 produce the greatest decline as they encourage more growth in the less developed communities in the region. As a consequence, Group 1 cities lose almost 25 per cent of their 1970 households under Alternative 4 and almost 13 per cent under Alternative 5.

TABLE V-1

YEAR 2000 HOUSEHOLDS BY COMMUNITY GROUP

(Figures in Parentheses are Per Cent Change from 1970)

Community Group	1970 Base	Alternative					
		1	2	3	4	5	6
Group 1	872408	845367 (-3.10)	837328 (-4.02)	868216 (-0.48)	655612 (-24.85)	761509 (-12.71)	857522 (-1.71)
Group 2	234990	373852 (59.09)	396932 (68.91)	368534 (56.83)	306134 (30.28)	361995 (54.05)	368966 (57.01)
Group 3	32431	36449 (12.39)	37147 (14.54)	36582 (12.80)	34234 (5.56)	36251 (11.78)	36166 (11.52)
Group 4	52106	118191 (126.83)	134259 (157.67)	115713 (122.07)	111830 (114.62)	116830 (124.22)	105784 (103.02)
Group 5	142856	356882 (149.82)	384852 (169.40)	343967 (140.78)	327272 (129.09)	359677 (151.78)	354613 (148.23)
Group 6	42934	162037 (277.41)	116542 (171.44)	144913 (237.53)	435551 (914.47)	231866 (440.05)	156593 (264.73)
Group 7	44910	205961 (358.61)	192591 (328.84)	220888 (391.85)	228244 (408.23)	230456 (413.15)	219461 (388.67)
REGION	1422635	2098739 (47.52)	2099651 (47.52)	2098813 (47.52)	2098877 (47.52)	2098584 (47.52)	2099105 (47.52)

TABLE V-2

YEAR 2000 POPULATION BY COMMUNITY GROUP

(Figures in Parentheses are Per Cent Change from 1970)

Community Group	1970 Base	Alternative 1	2	3	4	5	6
Group 1	2765166	1993156 (-27.92)	1969273 (-28.78)	2064452 (-25.34)	1442804 (-47.82)	1780884 (-35.60)	2036140 (-26.36)
Group 2	832900	907606 (8.97)	962054 (15.51)	901534 (8.24)	708461 (-14.94)	874266 (4.97)	900605 (8.13)
Group 3	103861	86374 (-16.84)	89097 (-14.22)	87354 (-15.89)	75647 (-27.17)	87220 (-16.02)	87315 (-15.93)
Group 4	180062	287704 (59.78)	328782 (82.59)	281900 (56.56)	261526 (45.24)	280837 (55.97)	258537 (43.58)
Group 5	524958	897358 (70.94)	999794 (90.45)	865614 (64.89)	814545 (55.16)	881951 (68.00)	882714 (68.15)
Group 6	154487	483066 (212.69)	348256 (125.43)	420725 (172.34)	1284999 (731.78)	692577 (348.31)	465112 (201.07)
Group 7	163877	571054 (248.47)	529095 (222.86)	604764 (269.04)	638465 (289.60)	628596 (283.58)	595952 (263.66)
REGION	4725311	5226318 (10.60)	5226351 (10.60)	5226343 (10.60)	5226447 (10.60)	5226331 (10.60)	5226375 (10.60)

Because the number of persons per household declines throughout the region from 1970 to 2000, Group 1 cities would have experienced a minimum population decline of 21 per cent had they lost no households. Thus, the population losses under Alternatives 1, 2, 3, and 6 are just slightly higher than what would be expected as the current population in these cities ages and family size decreases. The rather large declines in population that occur under Alternatives 4 and 5 are a consequence of both the greater declines in households resulting from these alternatives and declining household size.

Group 2 cities do better than their more developed counterparts primarily because they have greater capacity to accommodate new growth. As can be seen in Tables IV-5 and IV-6 these cities have between 50 to 100 per cent more residential holding capacity than Group 1 communities under all alternatives. As a result, the increase in households in Group 2 cities exceeds the regional growth rate of 48 per cent under all alternatives except Alternative 4. The greatest growth in households occurs under Alternative 2, where the total residential holding capacity in 1975 is just over 230,000 households, a fifth of the regional capacity for this alternative. Alternative 4 produces the least growth in Group 2 households with a holding capacity of 275,000. This higher capacity, however, is only three per cent of the total available capacity under this alternative. Thus, it is the relative scarcity of holding capacity, rather than the absolute amount, that produces the greater growth under Alternative 2.

Population decreases in Group 2 cities only under Alternative 4, where it drops 15 percent. Under Alternative 2 the 16 per cent increase in population exceeds the regional rate of 11 per cent. Population growth under the remaining alternatives is less than the regional rate, ranging from five to nine per cent between 1970 and 2000.

Of all community groups, Group 3 cities have the least capacity for growth both in per cent and absolute terms. Tables IV-5 and IV-6 indicate that the residential holding capacity of these cities ranges from 2,100 households under Alternative 6 to 5,000 households under Alternative 4. In all cases their capacity is an insignificant share of the total available in the region. None the less, these cities do gain households under all alternatives, partly due to redevelopment efforts. Like Group 2 cities they grow most under Alternative 2 and least under Alternative 4, while growth under the other alternatives averages about 12 per cent. Again, because of declining household size, population declines in these cities. Alternative 4 shows the greatest decline of about 27 per cent while all the others average about 16 per cent.

Group 4 cities experience considerable growth in both households and population under all alternatives. Like Group 2 cities they grow most under Alternative 2, and least under Alternative 4. Again, even though these cities have greater residential holding capacity under Alternative 4, they have a greater share of the total capacity under Alternative 2, which accounts for the higher rate of growth. This share does not vary much among the remaining alternatives, and hence the growth rate is about the same under each.

Townships, Groups 5, 6, and 7, grow fastest of all community groups under all alternatives. In most cases, Group 5 townships gain the greatest number of new households, followed by Group 7. Alternative 4 is an exception in that nearly half of the growth in the townships occurs in Group 6 communities, while the balance is split evenly among the others. Group 5 townships, which tend to be more urbanized than the other townships, grow fastest under Alternative 2, where policies encourage development in the existing urban areas. Group 7 townships currently have sewer capacity to accommodate additional growth, and consequently have plans for further development. These townships grow fastest under Alternative 5, which provides the best representation of their current plans. Group 6 and Group 7 townships grow least under Alternative 2, which discourages development in these areas because they contain considerable acreages of environmentally sensitive land. Since sewered development takes place at a lower density under Alternative 6, less growth can be accommodated in Group 6 communities than under Alternative 2. Clearly, if the density of development were lower in these areas under Alternative 2, much less growth would have occurred in the rural townships.

Figures V-1 and V-2 provide a visual summary of regional demographic trends as they appear at the community group level. Figure V-1 presents the percentage distribution of households by community group in 1970, and again, as it appears in the year 2000, for each alternative. Figure V-2 presents the percentage distribution of population in the same manner.

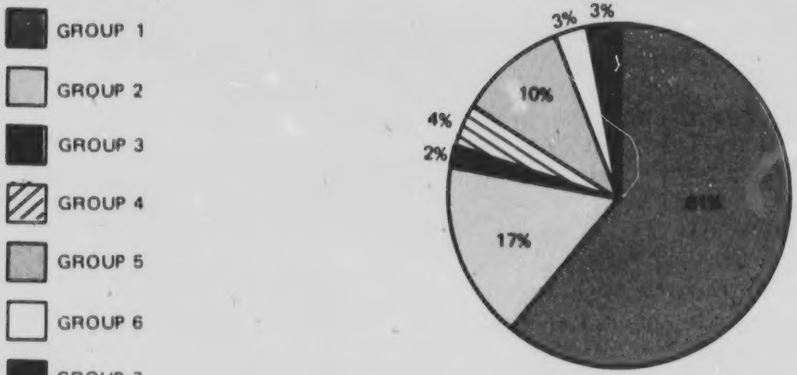
In 1970, ninety per cent of all households in the region were located in Community Groups 1, 2, 3, and 5. As mentioned earlier, these groups comprise nearly all of the existing urbanized area in the region. Under four alternatives the share of regional households in these areas drops to a figure between 77 and 79 per cent in the year 2000. The share is lower still under Alternatives 4 and 5. The shift in population follows the same pattern, but is more extreme.

Each alternative differs from the others both in the degree it shifts growth away from the urbanized areas, and in the manner it distributes growth in the less urbanized areas. Alternatives 2 and 3 exhibit subtle, but significant, differences. Both alternatives retain the same proportion of households and population in the large cities, which is the highest of all alternatives, but Group 1 cities are slightly more prominent under Alternative 3. Further, Alternative 2 encourages more growth in Group 4 cities and Group 5 townships than Alternative 3, concentrating development more areas that are already urban in character.

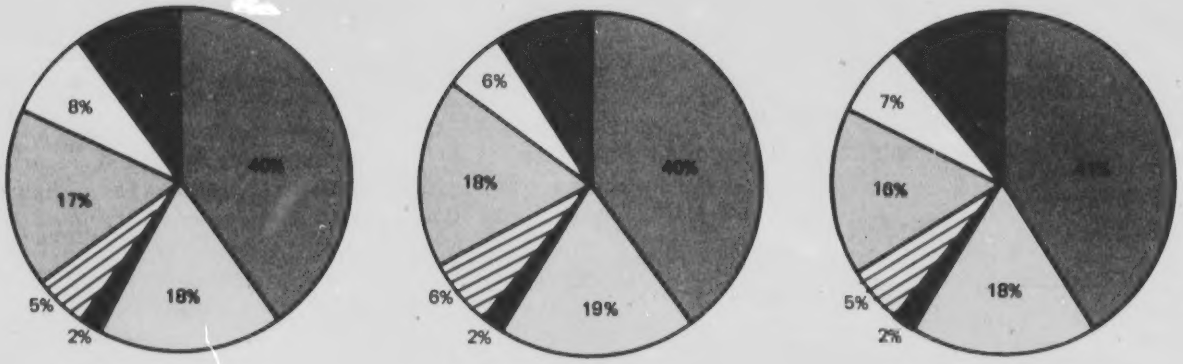
Alternatives 1 and 6 follow the same pattern as Alternative 3 but distribute slightly more growth in the less developed areas of the region. Alternative 6 distributes less growth among Group 6 communities, and consequently leaves a greater share of population and households in the larger cities than Alternative 1. Further, both alternatives shift more growth towards Group 5 townships, and less towards Group 7 townships than Alternative 3.

FIGURE V-1

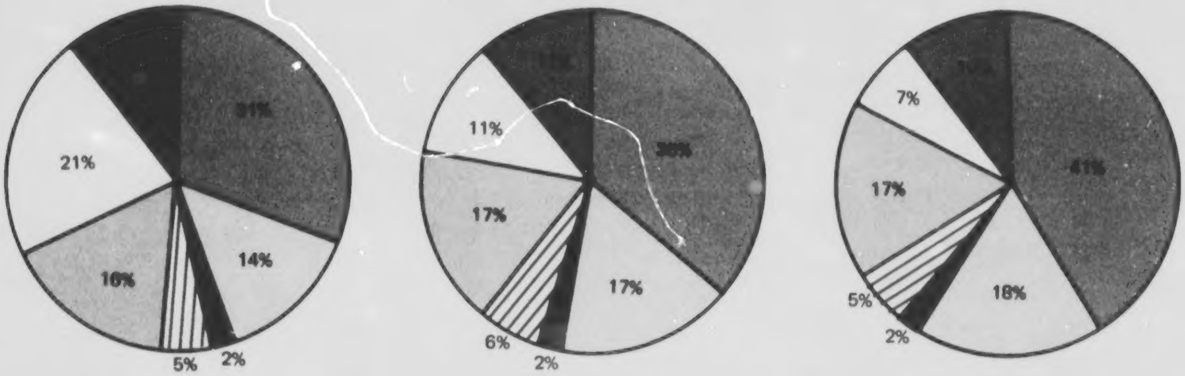
DISTRIBUTION OF HOUSEHOLDS BY COMMUNITY GROUP AND ALTERNATIVE 1970 AND 2000



1970
BASE



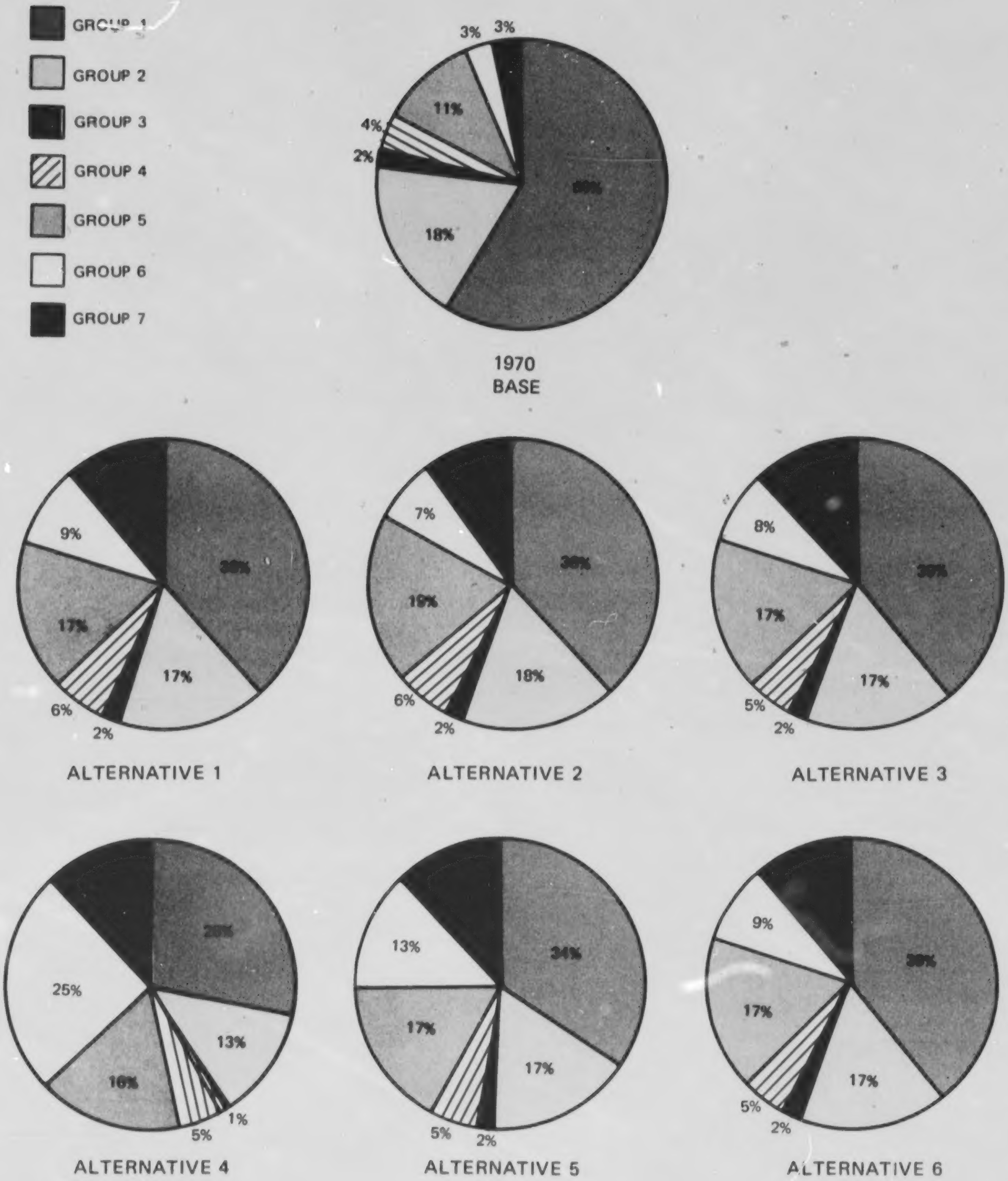
ALTERNATIVE 1 ALTERNATIVE 2 ALTERNATIVE 3



ALTERNATIVE 4 ALTERNATIVE 5 ALTERNATIVE 6

FIGURE V-2

DISTRIBUTION OF POPULATION BY COMMUNITY GROUP AND ALTERNATIVE 1970 AND 2000



Alternatives 4 and 5 represent extremes both in terms of their impact on older urbanized areas and development of the outlying areas. Alternative 4 substantially reduces the importance of large cities as centers of population reflected in a decrease in regional share from 77 per cent in 1970 to 41 per cent in 2000. The more rural townships, comprising Groups 6 and 7, gain most under Alternative 4, increasing from a 1970 base share of six per cent to a 2000 share of 37 percent. Alternative 5 follows a similar pattern in the older urban areas, but is less extreme than Alternative 4.

Households and Population in the Counties

Table V-3 and V-4 present the number of households and population in each county in the year 2000 for each alternative. The base figures for 1970 are also included to provide a basis to compute growth rates. For example, Table V-3 shows that households in Wayne County increase 52 per cent under Alternative 3 from a base of 332,687 in 1970 to 505,802 in the year 2000.

These tables show that Detroit declines in population and households under all alternatives. With Detroit excluded from Wayne County, no county loses households under any alternative. There are only three cases where counties lose population, and only one instance where the loss is greater than one per cent. Out-Wayne County loses 16.72 per cent of its 1970 population under Alternative 4 and a very small amount under Alternative 5. Macomb County also experiences a population loss of almost one per cent under Alternative 4.

Although Detroit is the only major area to suffer substantial decline, its rate of decline, and the rate of growth of each of the counties, vary considerably among the alternatives. Detroit's loss of households is kept below six per cent under Alternative 3 and Alternative 6, but the city loses a fifth of its 1970 population under Alternative 5, and a third under Alternative 4. Population loss in Detroit follows the same pattern as household loss.

The greatest growth in population and households in Wayne County occurs under Alternatives 1 and 2, while Alternatives 4 and 5 produce the least growth. Maximum population growth approaches nine per cent of the 1970 base under Alternative 2 while the county actually loses population under Alternatives 4 and 5. Households in the county grow the most under Alternatives 1 and 2 -- about 55 per cent -- and less than half as much under Alternative 4.

Oakland County grows most under Alternative 2 where households increase over 75 per cent and population increases over 31 per cent. Alternative 3 results in the least growth with households growing 52.4 per cent and population up 11.63 per cent. These results reflect the fact that the proportion of regional sewered holding capacity in Oakland County is lowest under Alternative 3 and highest under Alternative 2.

Macomb County grows most under Alternative 3 and least under Alternative 4. The increase in households ranges from less than 47 percent to over 72 per cent. Population actually drops slightly under Alternative 4, but increases by over 19 per cent under Alternative 3.

TABLE V-3

YEAR 2000 HOUSEHOLDS BY COUNTY
(Figures in Parentheses are Per Cent Change from 1970)

County	1970 Base	Alternative					
		1	2	3	4	5	6
Detroit	497682	449204 (-9.74)	452754 (-9.03)	469185 (-5.73)	328017 (-34.09)	392658 (-21.10)	468043 (-5.96)
Out-Wayne	332687	514424 (54.63)	518742 (55.92)	505802 (52.04)	413644 (24.33)	478430 (43.81)	494070 (48.51)
Oakland	265465	427890 (61.19)	466379 (75.68)	403604 (52.04)	427387 (61.00)	445144 (71.45)	428400 (61.38)
Macomb	171803	290827 (69.28)	282055 (64.17)	295975 (72.28)	251742 (46.53)	281548 (63.88)	284873 (65.81)
Washtenaw	68646	156099 (127.40)	145257 (111.60)	169864 (147.45)	199690 (190.90)	170765 (148.76)	162532 (136.77)
Monroe	33233	109852 (230.55)	93377 (180.98)	103490 (211.41)	131940 (297.02)	106051 (219.11)	95584 (187.62)
St. Clair	36230	95207 (162.78)	102186 (182.05)	91632 (152.92)	254482 (602.41)	108489 (199.45)	94011 (159.48)
Livingston	16889	55236 (227.05)	38901 (130.03)	59261 (250.89)	91975 (444.59)	105499 (524.66)	71592 (323.90)
REGION	1422635	2098739 (47.52)	2099651 (47.52)	2098813 (47.52)	2098877 (47.52)	2098584 (47.52)	2099105 (47.52)

TABLE V-4

YEAR 2000 POPULATION BY COUNTY

(Figures in Parentheses are Per Cent Change from 1970)

County	1970 Base	Alternative 1	2	3	4	5	6
Detroit	1510395	1054174 (-30.21)	1049570 (-30.51)	1112218 (-26.36)	716061 (-52.59)	910934 (-39.69)	1104902 (-26.85)
Out-Wayne	1153478	1251753 (8.52)	1256954 (8.97)	1232278 (6.83)	960591 (-16.72)	1151826 (-.14)	1203807 (4.36)
Oakland	906835	1066451 (17.60)	1188627 (31.07)	1012300 (11.63)	1042214 (14.93)	1140367 (25.75)	1074531 (18.49)
Macomb	624109	729847 (16.94)	718461 (15.12)	745853 (19.51)	618432 (-.91)	694348 (11.25)	709840 (13.74)
Washtenaw	233528	410950 (75.97)	377226 (61.53)	448774 (92.17)	543392 (132.69)	451814 (93.47)	430104 (84.18)
Monroe	118493	302105 (154.96)	256178 (116.20)	281207 (137.32)	362205 (205.68)	285007 (140.53)	247172 (108.60)
St. Clair	119503	247755 (107.32)	262561 (119.71)	233820 (95.66)	717546 (500.44)	280137 (134.42)	241453 (102.05)
Livingston	58970	163283 (176.89)	116774 (98.02)	159893 (171.14)	266006 (351.09)	311898 (428.91)	214566 (263.86)
REGION	4725311	5226318 (10.60)	5226351 (10.60)	5226343 (10.60)	5226447 (10.60)	5226331 (10.60)	5226375 (10.60)

The remaining counties, Washtenaw, Monroe, St. Clair, and Livingston, grow fastest of all counties, each more than doubling their 1970 households under all alternatives. All grow quite rapidly under Alternatives 4 and 5, St. Clair County growing fastest, followed by Livingston County. Washtenaw and Livingston Counties grow least under Alternative 2, while St. Clair County grows least under Alternative 3. The population of Monroe County grows least under Alternative 6, while households increase least under Alternative 2.

Figures V-3 and V-4 present the percentage distribution of households and population among the counties in the year 2000 for each alternative, as well as the original distributions in 1970. From these figures it is possible to see how each alternative affects the region as a whole. These figures again illustrate the decline of Detroit as a population center and demonstrate how each alternative affects the regional balance of population and households.

All of the alternatives tend to spread population throughout the region. Whereas 31.96 per cent of the regional population and 34.98 per cent of regional households were located in Detroit in 1970, much smaller proportions are forecast under all alternatives. Results from Alternatives 1, 2, 3, and 6 show 20 to 23 per cent of regional households and population located in Detroit in the year 2000. Alternatives 4 and 5 forecast an even smaller amount.

Outside Detroit, each alternative distributes new growth among the counties in a unique manner. Alternative 1 distributes households fairly evenly throughout the region. Each county receives a small increase in its share of regional households. Oakland County receives slightly less, while Monroe County gains a little more. Population growth is less evenly distributed, favoring Washtenaw and Monroe Counties. Wayne, Oakland and Macomb Counties essentially maintain the same proportion of total population as before, while St. Clair and Livingston Counties gain slightly.

Alternative 2 expands the regional share of households in Wayne, Washtenaw, Monroe and St. Clair Counties by a moderate amount. Oakland County gains a little more while Macomb County gains a little less. Livingston County maintains its existing share. The regional share of population in Wayne, Macomb and Livingston Counties remains fairly constant while the other counties gain in prominence, Oakland County gaining most.

Alternative 3 approximated the 1970 household shares for Wayne, Oakland and St. Clair Counties while expanding the share of Washtenaw and Monroe Counties. Macomb and Livingston Counties also gain, but by a smaller amount. The regional shift in population under this alternative follows the shift in households rather closely.

Under Alternative 4, the number of households in Detroit and Wayne County combined drops from 58 per cent of the regional total to 36 per cent. This loss is almost entirely translated into a gain for Washtenaw, Monroe, St. Clair and Livingston Counties, with the regional shares of Macomb and Oakland Counties remaining constant. The share in St. Clair County increases

FIGURE V-3

DISTRIBUTION OF HOUSEHOLDS BY COUNTY AND ALTERNATIVE 1970 AND 2000

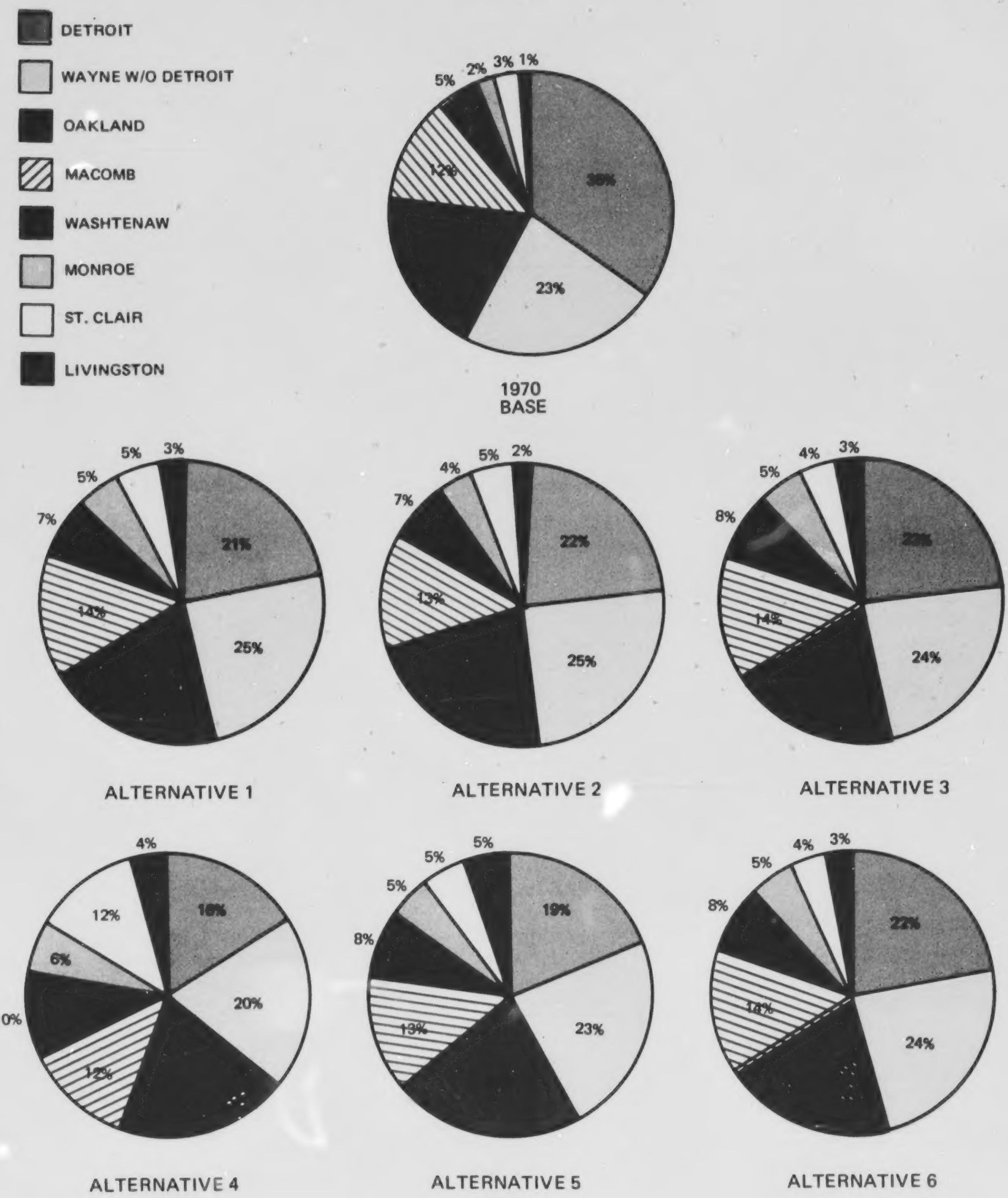
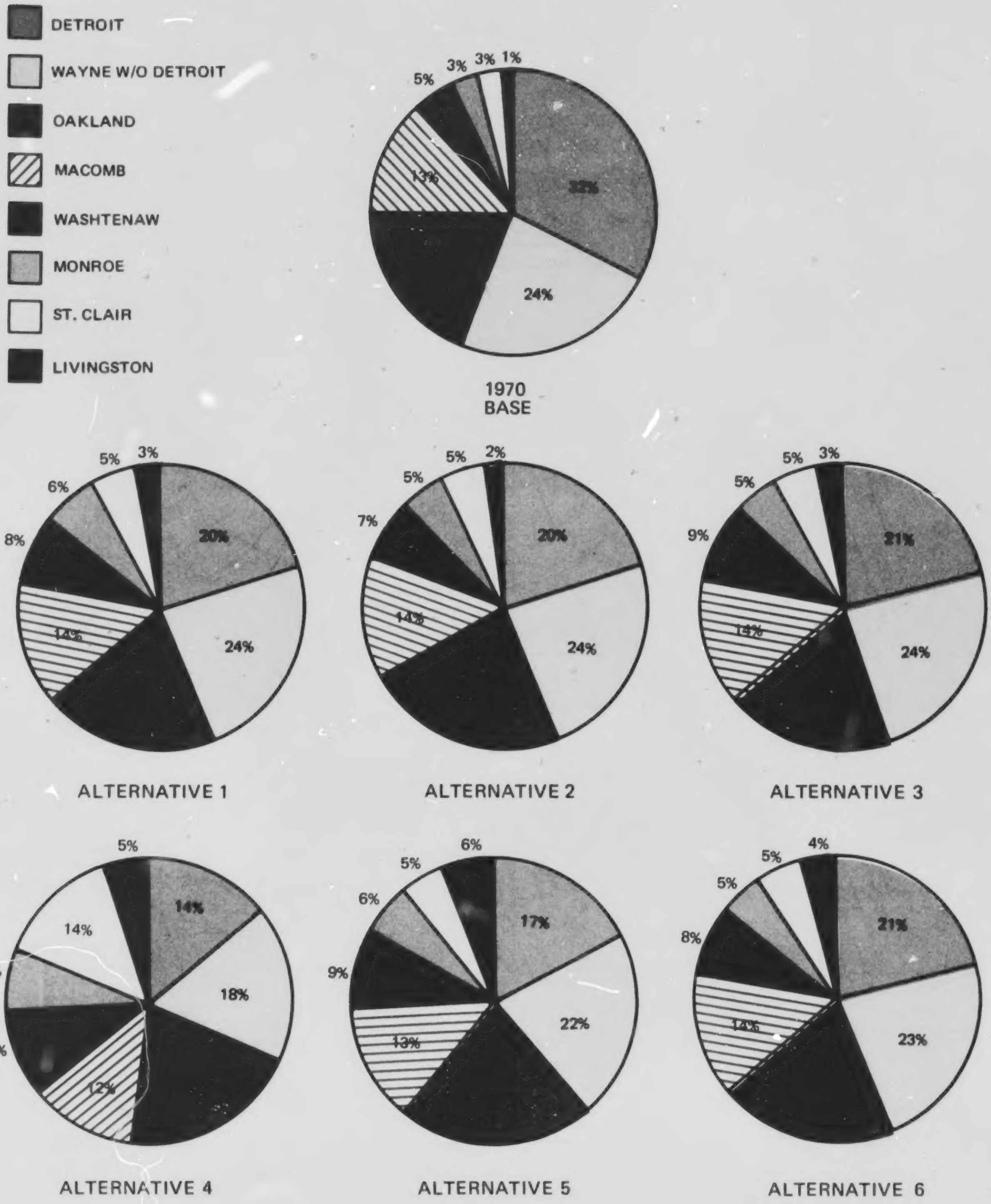


FIGURE V-4

DISTRIBUTION OF POPULATION BY COUNTY AND ALTERNATIVE 1970 AND 2000



four times while the shares of Washtenaw, Monroe and Livingston Counties more than double. Population shifts follow households, however, in a slightly more dramatic manner.

Alternative 5 shifts the bulk of new settlement into Oakland, Washtenaw and Livingston Counties. Out-Wayne and Macomb Counties maintain their initial shares of regional households. The share of Livingston County is increased more than four times, while the share of Oakland County is increased from 19 per cent of the total to 22 per cent. The shares of all the remaining counties are doubled. Out-Wayne is the only county whose share of regional population declines, and Macomb's share remains constant. Among the remaining counties, population follows household shifts.

Alternative 6 is similar to Alternative 3 in that Out-Wayne, Macomb, Washtenaw, Monroe, and St. Clair Counties received roughly the same growth in households under the two alternatives. The difference between the two is that Oakland County gains slightly and Detroit loses more under Alternative 6. Population growth is distributed differently under the two alternatives in that Out-Wayne and Washtenaw Counties lose slightly in their relative shares under Alternative 6 while Livingston County does much better.

It is interesting to note that the policies for Out-Wayne and Macomb Counties are identical under Alternatives 3 and 5, yet both counties do much better under Alternative 3. This bears out the idea that what happens in each county, and for that matter in each community in the region, is very much dependent upon the actions of the others in the region.

HOUSEHOLD SIZE AND THE DISTRIBUTION OF SCHOOL-AGE CHILDREN

Average household size and the number of school-age children in a community are measures that help to define the nature of the growth that occurs under each alternative. Increases in both measures are associated with an influx of younger households into a community, rapidly developing neighborhoods and expansion of public facilities. Decreases suggest an aging population and more established neighborhoods. The distribution of school-age children is presented first by county and then by community group in Tables V-5 and V-6. The percentage change in school-age children from 1970 to 2000 appears under each entry in the table. Average household size is reported by county and community group for each alternative in Tables V-7 and V-8.

Distribution of School Age Children

In general, the shift in the distribution of school-age children follows the shift in population, but it is more pronounced. Unlike the general population, the number of school-age children declines in the region from a total of 1,364,342 in 1970 to a projected total of 1,172,822 in 2000. In spite of this decline, four counties in the region, Washtenaw, Monroe, St. Clair and Livingston, gain in absolute numbers of school-age children under

TABLE V-5

YEAR 2000 SCHOOL-AGE CHILDREN BY COUNTY

(Figures in Parentheses are Per Cent Change from 1970)

County	1970 Base	Alternative					
		1	2	3	4	5	6
Detroit	386849	216478	211216	231565	131267	183758	228835
		(-44.04)	(-45.40)	(-40.14)	(-66.07)	(-52.50)	(-40.85)
Out-Wayne	351499	274091	273514	270036	195613	248072	263980
		(-22.02)	(-22.19)	(-23.18)	(-44.35)	(-29.42)	(-24.90)
Oakland	273285	240039	276274	229254	228133	258842	243746
		(-12.17)	(1.09)	(-16.11)	(-16.52)	(-5.28)	(-10.81)
Macomb	198009	166296	166347	170814	135970	154535	160458
		(-16.02)	(-15.99)	(-13.73)	(-31.33)	(-21.96)	(-18.96)
Washtenaw	62928	98006	88661	107972	134886	108344	103327
		(55.74)	(40.89)	(71.58)	(114.35)	(72.17)	(64.20)
Monroe	37322	76165	64220	69917	90798	69828	58298
		(104.08)	(72.07)	(87.33)	(143.28)	(87.10)	(56.20)
St. Clair	35653	58023	61072	53699	186170	65045	55781
		(62.74)	(71.30)	(50.62)	(422.17)	(82.44)	(56.46)
Livingston	18797	43732	31528	39558	70074	84398	58403
		(132.65)	(67.73)	(110.45)	(272.79)	(349.00)	(210.73)
REGION	1364342	1172830	1172832	1172815	1172911	1172822	1172833
		(-14.00)	(-14.00)	(-14.00)	(-14.00)	(-14.00)	(-14.00)

TABLE V-6

YEAR 2000 SCHOOL-AGE CHILDREN BY COMMUNITY GROUP

(Figures in Parentheses are Per Cent Change from 1970)

Community Group	1970 Base	Alternative 1	2	3	4	5	6
Group 1	755896	412570 (-45.42)	406055 (-46.28)	432304 (-42.81)	268358 (-64.50)	364154 (-51.82)	425917 (-43.65)
Group 2	253325	198104 (-21.80)	209861 (-17.16)	198756 (-21.54)	143529 (-43.34)	189287 (-25.28)	198017 (-21.83)
Group 3	29535	17976 (-39.14)	18894 (-36.03)	18364 (-37.82)	14161 (-52.05)	18588 (-37.06)	18656 (-36.83)
Group 4	55135	63090 (14.43)	72923 (32.26)	61834 (12.15)	54122 (-1.84)	60339 (9.44)	56721 (2.88)
Group 5	170483	207217 (21.55)	239351 (40.40)	199894 (17.25)	184090 (7.98)	197220 (15.68)	201200 (18.02)
Group 6	49232	129020 (162.07)	92766 (88.43)	109842 (123.11)	345981 (602.76)	186386 (278.59)	123839 (151.54)
Group 7	50735	144853 (185.51)	132982 (162.11)	151820 (199.24)	162670 (220.63)	156848 (209.15)	148485 (192.67)
REGION	1364341	1172830 (-14.00)	1172833 (-14.00)	1172814 (-14.00)	1172911 (-14.00)	1172822 (-14.00)	1172835 (-14.00)

TABLE V-7

YEAR 2000 PERSONS PER HOUSEHOLD BY COUNTY

County	Alternative						
	1970 Base	1	2	3	4	5	6
Detroit	3.03	2.35	2.32	2.37	2.18	2.32	2.36
Out-Wayne	3.47	2.43	2.42	2.44	2.32	2.41	2.44
Oakland	3.42	2.49	2.55	2.51	2.44	2.51	2.51
Macomb	3.63	2.51	2.55	2.52	2.46	2.47	2.49
Washtenaw	3.40	2.63	2.60	2.64	2.72	2.65	2.65
Monroe	3.57	2.75	2.74	2.72	2.75	2.69	2.59
St. Clair	3.30	2.60	2.57	2.55	2.82	2.58	2.57
Livingston	3.49	2.96	3.00	2.70	2.89	2.96	3.00
REGION	3.32	2.49	2.49	2.49	2.49	2.49	2.49

TABLE V-8

YEAR 2000 PERSONS PER HOUSEHOLD BY COMMUNITY GROUP

Community Group	Alternative						
	1970 Base	1	2	3	4	5	6
Group 1	3.17	2.36	2.35	2.38	2.20	2.34	2.37
Group 2	3.54	2.43	2.42	2.45	2.31	2.42	2.44
Group 3	3.20	2.37	2.40	2.39	2.21	2.41	2.41
Group 4	3.46	2.43	2.45	2.44	2.34	2.40	2.44
Group 5	3.67	2.51	2.60	2.52	2.49	2.45	2.55
Group 6	3.60	2.98	2.99	2.90	2.95	2.99	2.97
Group 7	3.65	2.77	2.75	2.74	2.80	2.73	2.72
REGION	3.32	2.49	2.49	2.49	2.49	2.49	2.49

all alternatives, while the remaining counties experience considerable losses. A similar pattern occurs among the community groups, with Groups 1, 2 and 3 losing a fifth to more than half of the school enrollment under the various alternatives.

Each of the alternatives produces a distribution of school-age children that follows the same general patterns. The only differences among them lie in how pronounced the pattern becomes. In all cases, the larger, more developed Group 1 cities lose the greatest proportion of their school-age population followed by Group 3 cities and then Group 2 cities. Of those community groups that show gains, Group 4 cities gain least followed by the large townships in Group 5 that do slightly better. The smaller townships show the most gains with those in Group 7 exhibiting more growth than those in Group 6 in all but two alternatives. Under Alternative 4 and 5, the reverse holds true. Overall, this pattern is most accentuated by Alternative 4 and least by Alternative 2.

Household Size

Persons per household decline 25 per cent from the regional average of 3.32 in 1970 to 2.49 in year 2000. Generally speaking, this ratio drops most in Out-Wayne, Oakland and Macomb Counties, while the decline in Detroit and other counties is less than average. The ranking of household size by county shifts somewhat as a result. In 1970, Macomb, Monroe, Livingston, and Out-Wayne Counties had higher average household sizes than the rest. Under most alternatives, the ranking in the year 2000 begins with Livingston County followed by Monroe, Washtenaw and St. Clair, reflecting the general shift of population and households already described.

At the community group level, the only groups to exhibit substantial decline in household size across all alternatives are the large communities in Group 2 and Group 5. Group 6 communities decline much less than average while the other communities are fairly close to the average regional decline. In 1970, the larger households were found in Group 5 communities followed by Groups 7, 6 and 2. Again, the regional shifts in households and population are such that under all alternatives the larger households in 2000 are located in Group 6 townships followed by Groups 7, 5 and 4.

HOLDING CAPACITY

Introduction

The following section contains an analysis of holding capacities* which remain at the year 2000. Non-sewered and sewered holding capacities are considered separately.

As Chapter IV indicated in detail, holding capacity for sewered and non-sewered land is calculated in the same way: number of acres of vacant residentially zoned land multiplied by the permitted density in the land as specified by TWG. However, the two capacities behave differently through the forecast period.

Non-sewered holding capacity always decreases and it can do so in one of three ways: 1) Some non-sewered land is utilized for development. This results in the conversion of some land from vacant to residential, with a consequent reduction in the amount of vacant land. 2) Some non-sewered land becomes sewered. For example, an area might contain 500 acres of vacant land in 1970, with 100 acres scheduled to be sewered in 1980, 200 acres scheduled to be sewered in 1990, and 200 not scheduled for sewer throughout the forecast period. Assuming none of the land had been converted to residential use by 1980, the non-sewered holding capacity would be reduced by one-fifth in the 1980 forecast period, since 100 of the 500 acres would become sewered by that time. 3) Environmentally sensitive land may be protected. As explained in Chapter IV, environmentally sensitive land such as flood plains, shorelines and prime agricultural land may be protected from residential development. When this option is specified, the holding capacity for a protected area becomes zero. This means that the model cannot consider the land for residential development, regardless of how attractive the area may be. In addition, protection also implies that the area will not be sewered throughout the forecast period. Varying degrees of protection were in effect under Alternatives 1, 2 and 6. Protection policies were also reflected in Alternative 3 by assigning extremely low permitted densities in many rural areas of the region after 1975.

Sewered holding capacity may either increase or decrease during the forecast period. It decreases when vacant, sewered, residentially zoned land is converted to residential use when formerly vacant land is no longer vacant. It may increase in one of two ways: 1) When sewers are extended into an area, the non-sewered holding capacity decreases, but the sewered holding capacity increases. Typically, total holding capacity increases because the density is almost always higher on sewered land. Increases in both sewered and total holding capacity from this type of activity vary considerably by alternative (see Chapter IV, which discussed holding capacity inputs), and are most evident in suburban fringe areas where sewered extensions are most prevalent. 2) Previously developed land can again become vacant through redevelopment or demolition of vacant residential dwelling units. Thus, the quantity of vacant land is increased and the sewered holding capacity grows as a reflection of the increased land. This latter phenomenon is most evident over the forecast period in the City of Detroit, which experiences both substantial redevelopment and large numbers of demolition.

Remaining Non-Sewered Holding Capacity

At the regional level, the remaining non-sewered holding capacities for the various alternatives in the year 2000 are:

	Alternative					
1970 Base	1	2	3	4	5	6
510,134	235,635	52,379	50,539	0	217,226	185,664

These numbers reflect the various policy inputs under Alternative 4, where the entire region was considered to be sewered, so non-sewered holding capacity ceased to exist. The most stringent protection policies were applied in Alternatives 2 and 3, and they demonstrate the lowest remainder among the other alternatives. Moderate protection policies were applied in Alternatives 1 and 6, which show smaller reduction for that reason. In Alternative 5, no protection policies were applied. The reductions in Alternative 5 are due primarily to extension of sewer and quite extensive amounts of development regionwide on non-sewered land. The distribution of protected land is presented by alternative in Table IV-3. For a more comprehensive review, the reader should also consult the section in Chapter V entitled Conversion of Environmentally Sensitive Land to see how the distribution of new development has affected these figures.

Remaining Sewered Holding Capacity

At the regional level the sewered holding capacities remaining in the year 2000 are:

	Alternative					
1970 Base	1	2	3	4	5	6
529,241	894,809	975,970	831,801	9,116,315	1,023,985	641,872

The regionwide growth in households from 1970 to 2000 is forecast to be 676,295. Thus, enough sewered holding capacity existed in 1970 to accommodate almost 80 per cent of the growth expected for the next 30 years. When the additional amounts of sewer proposed under the various alternatives is taken into consideration, more sewered holding capacity remains at the end of the forecast period under all alternatives than existed at the beginning.

The results from the various alternatives again reflect the policies behind them. Alternative 4 sewers the entire region and consequently a very large amount of sewered holding capacity remains in 2000. The smallest remaining sewered holding capacity is seen under Alternative 6, which reflects more limited sewer extensions at low to moderate densities. Alternative 2 has fewer sewer extensions (i.e., fewer vacant acres which are sewered), but assigns higher densities to them which results in higher remaining holding capacities. Alternative 5 contains the second largest quantity of remaining sewered holding capacity, resulting from larger sewer extensions than the other alternatives. Almost twice as much sewered holding capacity remains in 2000 as existed in 1970.

Tables V-9 and V-10 present the remaining sewered and non-sewered holding capacity by Community Group. Substantial increases are seen in Group 1, primarily due to redevelopment under Alternatives 1, 2, 3, 5, and 6, and to demolitions in older areas under Alternative 4. The demolitions occur because more households move out of existing developed areas under this alternative, causing vacancies which result in demolition. Smaller changes are seen in Groups 2, 3 and 4 (except under Alternative 4) because their

TABLE V-9

YEAR 2000 REMAINING SEWERED HOLDING CAPACITY BY COMMUNITY GROUP (IN DWELLING UNITS)
(Percentage Distribution is Given in Parenthesis)

Community Group	1970 Base	Alternative					
		1	2	3	4	5	6
Group 1	97108	263868 (29.49)	305393 (31.29)	258526 (31.08)	383178 (4.20)	370775 (36.21)	260854 (40.64)
Group 2	135008	116305 (13.00)	169619 (17.38)	88594 (10.65)	302544 (3.32)	99983 (9.76)	90976 (14.17)
Group 3	3516	592 (0.07)	949 (0.10)	285 (0.03)	6482 (0.07)	2232 (0.22)	1954 (0.30)
Group 4	42213	33442 (3.74)	37583 (3.85)	22139 (2.66)	148666 (1.63)	25151 (2.46)	19615 (3.06)
Group 5	157133	177805 (19.87)	224058 (22.96)	152658 (18.35)	934533 (10.25)	174999 (17.09)	117222 (18.26)
Group 6	1679	43532 (4.86)	25593 (2.62)	23489 (2.82)	5176084 (56.78)	62324 (6.09)	11096 (1.73)
Group 7	92584	259265 (28.97)	212775 (21.80)	286110 (34.40)	2164828 (23.75)	288521 (28.18)	140155 (21.84)
REGION	529241	894809 (100.00)	975970 (100.00)	831801 (100.00)	9116315 (100.00)	1023985 (100.00)	641872 (100.00)

TABLE V-10

YEAR 2000 REMAINING NON-SEWERED HOLDING CAPACITY BY COMMUNITY GROUP (IN DWELLING UNITS)
(Percentage Distribution is Given in Parentheses)

Community Group	1970 Base	Alternative					
		1	2	3	4	5	6
Group 1	1230	67 (.03)	107 (.20)	48 (.09)	0 (0)	99 (.05)	62 (.03)
Group 2	11210	181 (.08)	615 (1.17)	93 (.18)	0 (0)	80 (.04)	167 (.09)
Group 3	198	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Group 4	13269	1014 (.43)	1339 (2.56)	719 (1.42)	0 (0)	377 (.17)	3047 (1.64)
Group 5	77481	11868 (5.04)	5952 (11.36)	4770 (9.44)	0 (0)	7860 (3.62)	9005 (4.85)
Group 6	302569	177194 (75.20)	34716 (66.28)	31991 (63.30)	0 (0)	165039 (75.98)	136127 (73.32)
Group 7	104177	45311 (19.23)	9650 (18.42)	12918 (25.56)	0 (0)	43771 (20.15)	37256 (20.07)
REGION	510134	235635 (100.00)	52379 (100.00)	50539 (100.00)	0 (0)	217226 (100.00)	185664 (100.00)

populations are more stable and fewer sewer extensions are proposed for any of the areas. Increases in remaining sewered holding capacities are generally seen in all township areas for most alternatives. This indicates that, even after population increases in these areas are taken into account, substantially more vacant sewered areas exist in the townships in 2000 than were there in 1970. Alternatives 4 and 5 have the most extra sewered holding capacity and Alternative 6 the least.

Results are somewhat less consistent when examined by county in Tables V-11 and V-12. Increases in the City of Detroit parallel the results seen in Group 1 communities, and suggest the City's dominance of that group's results. Out-Wayne (with the exception of Alternative 4) shows stable or decreasing quantities, which are due to limited sewer extensions coupled with increased population, and the associated conversion of vacant to developed residential land. All the remaining counties end up with more sewered holding capacity than they had in 1970, except for a few isolated cases in Washtenaw and Oakland Counties. Under Alternative 6 the least sewered holding capacity remains in most of these counties. In Oakland and Livingston Counties, Alternative 3 results in greater utilization of the capacity of existing and proposed sewer extensions.

Conclusions

Under all alternatives the amount of sewered holding capacity that remains in 2000 is more than the amount that was available in 1970. Alternative 6 produces the least surplus over all, and in most communities as well. Alternative 4 clearly produces most surplus in all areas as it increases the capacity in existing urbanized areas through housing demolition and sewers the remaining areas at very high densities. Alternative 2 is interesting in that it generates almost as much surplus as Alternative 5. This surplus is partly due to the high minimum imposed on the density of sewered development. Under Alternative 2 development occurs at such a high density it uses less land than the other alternatives, and therefore leaves more sewered land undeveloped. Further, the amount of land that remains has a higher capacity than that remaining under the other alternatives. Thus, the potential for minimizing unused sewered holding capacity is greatest under this alternative.

The amount of sewered holding capacity that remains in the region in the year 2000 represents unused capital investment. Those alternatives which reduce this surplus the most, and at the same time minimize the total capital investment required to sewer development in the region, represent more efficient sewering policies. Chapter VI analyzes the fiscal implications of these sewering policies in greater detail.

TABLE V-11

YEAR 2000 REMAINING SEWERED HOLDING CAPACITY BY COUNTY (IN DWELLING UNITS)
(Percentage Distribution is Given in Parentheses)

County	1970 Base	Alternative 1	2	3	4	5	6
Detroit	66285	239681 (26.79)	274873 (28.16)	239521 (28.80)	305273 (3.35)	337430 (32.95)	238910 (37.22)
Out-Wayne	194791	203652 (22.76)	215904 (22.12)	138896 (16.70)	517990 (5.68)	155767 (15.21)	118990 (18.54)
Oakland	63711	95487 (10.67)	170881 (17.51)	58190 (7.00)	1429202 (15.68)	128028 (12.50)	77481 (12.07)
Macomb	85915	168947 (18.88)	131217 (13.44)	162095 (19.49)	857161 (9.40)	169012 (16.51)	93546 (14.57)
Washtenaw	82745	80916 (9.04)	76232 7.81)	151636 (18.23)	1647959 (18.08)	99002 (9.67)	67554 (10.52)
Monroe	17851	60189 (6.73)	48016 (4.92)	28204 (3,39)	1353747 (14,85)	38541 (3.76)	19467 (3.03)
St. Clair	15108	33761 (3.77)	51624 (5.29)	49422 (5.94)	1640165 (17.99)	66136 (6.46)	18404 (2.87)
Livingston	2835	12176 (1.36)	7223 (.74)	3837 (.46)	1364818 (14.97)	30069 (2.94)	7520 (1.17)
REGION	529241	894809 (100.00)	975970 (100.00)	831801 (100.00)	9116315 (100.00)	1023985 (100.00)	641872 (100.00)

TABLE V-12

YEAR 2000 REMAINING NON-SEWERED HOLDING CAPACITY BY COUNTY (IN DWELLING UNITS)
(Percentage Distribution is Given in Parentheses)

County	1970 Base	Alternative 1	2	3	4	5	6
Detroit	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Out-Wayne	8308	1129 (.48)	124 (.24)	711 (1.41)	0 (0)	760 (.35)	901 (.49)
Oakland	154350	54020 (22.93)	43031 (82.15)	16705 (33.05)	0 (0)	41836 (19.26)	66770 (35.96)
Macomb	21834	4963 (2.11)	4193 (8.01)	5364 (10.61)	0 (0)	5143 (2.37)	5790 (3.12)
Washtenaw	80890	46758 (19.84)	219 (.42)	9368 (18.54)	0 (0)	49123 (22.61)	27896 (15.02)
Monroe	49111	26435 (11.22)	141 (.27)	14681 (29.05)	0 (0)	20130 (9.27)	8265 (4.45)
St. Clair	53872	18350 (7.79)	3958 (7.56)	1239 (2.45)	0 (0)	20103 (9.25)	10950 (5.90)
Livingston	141769	83980 (35.64)	713 (1.36)	2471 (4.89)	0 (0)	80131 (36.89)	65092 (35.06)
REGION	510134	235635 (100.00)	52379 (100.00)	50539 (100.00)	0 (0)	217226 (100.00)	185664 (100.00)

EMPLOYMENT

Introduction

This section presents employment figures for the counties and the region. Results are presented separately for the basic and non-basic industries. The basic industries are comprised of auto and other manufacturing; the non-basic industries consist of the service and public sectors, such as gas stations and banks.

Two different analyses are performed. First, the results are compared in terms of absolute value and the per cent change in absolute value from 1970 to 2000 for each of the counties and the City of Detroit. Second, the change in distribution of employment among the counties in the base year and the year 2000 for each alternative is examined.

Basic Employment: Regionwide

Basic employment in the region grows from a base in 1970 of 658,425 jobs to 774,749[1] jobs by the year 2000. Since the same regional forecast is used for each alternative, the number of basic jobs to be distributed within the region is held constant for all six alternatives.[2] The growth, regionwide, in basic jobs represents a 17.67 per cent increase over the 30 years. This compares with 10.60 per cent increase in population and a 47.5 per cent increase in households. Thus, at the regional level, the number of basic employment jobs per capita increases from .139 in 1970 to .148 in 2000, while the number of basic employment jobs per household decreases from .463 in 1970 to .369 in 2000. These numbers reflect the trend toward smaller household size which is a part of the regional control totals.

Basic Employment: Absolute and Per Cent Change 1970 to 2000

Table V-13 presents the basic employment results. Two sets of numbers are included: the absolute values for 1970 and 2000 for each alternative and the per cent change calculated from 1970 to 2000 for each alternative. From Table V-13, it is apparent that the only area showing a decline from 1970 to 2000 is the City of Detroit which has less basic employment in the year 2000 under all alternatives. The decline in basic jobs for the City of Detroit ranges from 3.83 per cent under Alternative 2 to 12.87 per cent under Alternative 4, or 7,724 jobs and 25,957 jobs, respectively.

All the other counties gain basic employment over the forecast period. Out-Wayne and Oakland Counties both show small positive percentage changes in the ranges of 7.03 per cent to 16.17 per cent and 1.45 per cent to 18.07 per cent, respectively. Macomb and Washtenaw Counties both show a fairly large percentage increase in basic employment, with the largest increases evidenced under Alternative 3 for Macomb and under Alternative 4 for Washtenaw. The remaining three counties all show large percentage increases under all alternatives ranging from 146.59 per cent to 380.60 per cent for

TABLE V-13

YEAR 2000 BASIC EMPLOYMENT BY COUNTY
(Figures in Parentheses are Per Cent Change from 1970)

County	1970 Base	Alternative 1	2	3	4	5	6
Detroit	201676	186426 (-7.56)	193952 (-3.83)	186473 (-7.54)	175719 (-12.87)	179958 (-10.77)	184682 (-8.43)
Out-Wayne	207932	228575 (9.93)	241559 (16.17)	235394 (13.21)	222550 (7.03)	226081 (8.73)	232062 (11.60)
Oakland	101588	108964 (7.26)	112328 (10.57)	103061 (11.45)	119942 (18.07)	116588 (14.77)	111850 (10.10)
Macomb	94573	134288 (41.99)	141091 (49.19)	150729 (59.38)	139003 (46.98)	142382 (50.55)	144110 (52.38)
Washtenaw	32194	47722 (48.23)	45260 (40.59)	43964 (36.56)	48920 (51.95)	46815 (45.42)	45332 (40.81)
Monroe	7540	36237 (380.60)	18593 (146.59)	26276 (248.49)	33798 (348.25)	31815 (321.95)	27362 (262.89)
St. Clair	10230	23348 (128.23)	17699 (73.01)	23291 (127.67)	24031 (134.91)	20129 (96.76)	20248 (97.93)
Livingston	2692	9189 (241.34)	4270 (58.62)	5574 (107.06)	10799 (301.15)	10986 (308.10)	9115 (238.60)
REGION	658425	774749 (17.67)	774752 (17.67)	774762 (17.67)	774762 (17.67)	774754 (17.67)	774761 (17.67)

Monroe, 73.01 per cent to 134.91 per cent for St. Clair and 58.62 per cent to 308.10 per cent for Livingston.

The above observations lead to several conclusions. First, all alternatives tend to disperse employment throughout the region over the forecast period. The high growth rates for the less urbanized counties are evidence of this trend. Taken together, the more rural counties of Washtenaw, Monroe, St. Clair, and Livingston grow between 62.99 per cent for Alternative 2 to 123.24 per cent for Alternative 4, which is significantly higher than the regionwide rate of 17.67 per cent.

Second, the differences between the alternatives are outweighed by the common trends in distribution for all alternatives. The few exceptions to this observation are evidenced in the low results for Livingston, St. Clair and Monroe Counties under Alternative 2. In these cases, it can be assumed that industrially zoned land was limited due to the preservation theme of Alternative 2, thus constraining growth in basic employment to a lower per cent change than under all the other alternatives.

Basic Employment: Percentage Distribution

Table V-14 is derived from the absolute values presented in Table V-13 and shows the percentage distribution of basic employment for each county in 1970 and in 2000 for each alternative. It is clear from Table V-14 that a shift occurs under all the alternatives from the 1970 concentration in Detroit, Out-Wayne and Oakland to more spread by 2000 into Macomb and the predominantly rural counties of Washtenaw, Monroe, St. Clair and Livingston.

TABLE V-14

PERCENTAGE DISTRIBUTION OF BASIC EMPLOYMENT BY COUNTY AND ALTERNATIVE

County	1970 Base	Alternative					
		1	2	3	4	5	6
Detroit	30.63	24.06	25.03	24.07	22.68	23.23	23.84
Out-Wayne	31.58	29.50	31.18	30.38	28.72	29.18	29.95
Oakland	15.43	14.06	14.50	13.30	15.48	15.05	14.44
Macomb	14.36	17.33	18.21	19.45	17.94	18.38	18.60
Washtenaw	4.89	6.16	5.84	5.67	6.31	6.04	5.85
Monroe	1.15	4.68	2.40	3.39	4.36	4.11	3.53
St. Clair	1.55	3.01	2.28	3.01	3.10	2.60	2.61
Livingston	.41	1.19	.55	.72	1.39	1.42	1.18

Detroit drops five per cent or more in its share of the regional basic employment from its 1970 base share of 30.63 per cent. Losses in Out-Wayne are less dramatic, running less than three per cent across all of the alternatives. Oakland County increases its share slightly under Alternative 4, but loses a small percentage of its share in all the other alternatives.

Macomb County's share increases the most of any of the remaining counties, gaining an additional three to five per cent of the region's basic employment in all alternatives. Macomb County had 14.36 per cent of regional basic employment in 1970, compared with forecast percentages ranging from 17.33 per cent under Alternative 1 to 19.45 per cent under Alternative 3.

Washtenaw, Monroe, St. Clair, and Livingston all show gains in percentage share of basic employment. The gains range from less than one per cent to three percent, with Monroe showing the most fluctuation between alternatives. Together the four more rural counties in the region show a gain in percentage share of regional basic employment from the base total of 8.00 per cent to a maximum forecast total of 15.16 per cent under Alternative 4.

Basic Employment: Conclusions

One conclusion that can be drawn from the above analysis is that basic employment, unlike households and population, is relatively insensitive to the sets of policy inputs incorporated in the six alternatives. The overall shape of the distribution of basic industry jobs seen in the 1970 base is perpetuated under all alternatives. The apparent insensitivity of the model to policy inputs regarding zoning for industry might be attributed, in part, to the surplus of industrially zoned land under all of the alternatives.

Regionwide, industrially zoned land ranges from 39,267 acres under Alternative 1 to 182,292 acres under Alternative 4 (see Table IV-1). Land consumed for both basic and non-basic employment ranges from 27,106 acres under Alternative 2 to 32,850 acres under Alternative 4 (see Table V-17). From a comparison of these numbers, it is clear that even under the most conservation oriented alternative, more acres are zoned for basic employment than used for both basic and non-basic employment. The comparative numbers are presented below for all of the alternatives.

	Alternative					
	1	2	3	4	5	6
Acres zoned for Basic Industry (1970)	39267	46123	80447	182292	105280	66349
Acres used for Basic and Non-Basic Industry (1970-2000)	29017	27106	28504	32850	30797	28990

Additionally, the lack of significant changes in the distribution of basic employment might be attributed to the high capital investment in existing plant facilities. Due to this high plant investment, large scale shifts in basic employment are unlikely to occur even over a 30-year period.

Non-Basic Employment: Regionwide

Table V-18 presents the results from the Non-Basic Employment models, consisting of the service and public sector jobs. Focusing first on the regional control totals, non-basic employment increases from 1,071,726 jobs in 1970 to 1,488,009 jobs in the year 2000, or 38.84 per cent increase. This is a larger per cent increase for the region on a whole than the 17.67 per cent increase noted for basic employment. The increased importance of non-basic jobs in the regional totals represents the expected shift to a more service-oriented regional economy.

Non-Basic Employment: Absolute and Per Cent Change 1970 to 2000

Table V-15 contains both the absolute numbers of non-basic jobs forecast for each alternative and the per cent change between the 1970 basic value and the forecast values in each case. Comparison between this table and Table V-13, presenting the basic employment results, reveals some interesting trends. For all alternatives except Alternative 2, non-basic employment grows less in the more rural counties than was the case for basic employment. Relatedly, the more urbanized counties show larger per cent changes for non-basic than for basic employment. These observations may be explained by the fact that growth in non-basic employment is related to centers of population, whereas growth in basic employment is related to available industrially zoned land and existing plants.

In contrast with Detroit's small increase in non-basic jobs under all six alternatives, the other more urbanized counties of Out-Wayne, Oakland and Macomb all show moderate increases. These increases are as follows: from 32.12 per cent under Alternative 4 to 40.98 per cent under Alternative 1 for Out-Wayne; from 62.02 per cent under Alternative 3 to 78.64 per cent under Alternative 4 for Oakland; and from 48.78 per cent under Alternative 1 to 55.19 per cent under Alternative 3 for Macomb.

The predominantly rural counties of Washtenaw, Monroe, St. Clair, and Livingston all experience large increases in non-basic jobs, in parallel with the general increases in population in these areas under all the alternatives. Again, in St. Clair and Livingston Counties, the largest percentage increases in non-basic employment are experienced under the alternatives which forecast the greatest increases in population.

Non-Basic Employment: Percentage Distribution

Table V-16 presents the percentage distribution of non-basic jobs between the counties and the City of Detroit in the 1970 base year and under each of the six alternatives. Detroit and Out-Wayne are the only areas which

TABLE V-15

YEAR 2000 NON-BASIC EMPLOYMENT BY COUNTY
(Figures in Parentheses are Per Cent Change from 1970)

County	1970 Base	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Detroit	449585	484025 (7.66)	488412 (8.64)	487100 (8.34)	469298 (4.38)	470139 (4.57)	486483 (8.21)
Out-Wayne	211634	298362 (40.98)	294404 (39.11)	293407 (38.64)	279612 (32.12)	281376 (32.95)	290898 (37.45)
Oakland	198328	331925 (67.36)	341263 (72.07)	321324 (62.02)	354289 (78.64)	348145 (75.54)	331790 (67.29)
Macomb	106892	159031 (48.78)	162000 (51.55)	165890 (55.19)	159339 (49.07)	160650 (50.29)	163497 (52.96)
Washtenaw	60877	119789 (96.77)	111796 (83.64)	121524 (99.62)	120545 (98.01)	122982 (102.02)	120267 (97.56)
Monroe	14352	39400 (174.53)	33122 (130.78)	36598 (155.00)	39017 (171.86)	34871 (142.97)	34628 (141.28)
St. Clair	21347	34780 (62.93)	38505 (80.38)	36047 (68.86)	42847 (100.72)	38262 (79.24)	35867 (68.02)
Livingston	8711	20535 (135.74)	18304 (110.13)	25977 (198.21)	22869 (162.53)	31399 (260.45)	24381 (179.89)
REGION	1071726	1487847 (38.84)	1487806 (38.84)	1487867 (38.84)	1487816 (38.84)	1487824 (38.84)	1487811 (38.84)

consistently lose in their share of non-basic jobs. Out-Wayne County provides an exception under Alternative 1 where it gains a fraction of a percentage share.

TABLE V-16

PERCENTAGE DISTRIBUTION OF NON-BASIC EMPLOYMENT BY COUNTY AND ALTERNATIVE

County	1970 Base	Alternative 1	2	3	4	5	6
Detroit	41.95	32.53	32.83	32.74	31.54	31.60	32.70
Out-Wayne	19.95	20.05	19.79	19.72	18.79	18.91	19.55
Oakland	18.51	22.31	22.94	21.60	23.81	23.40	22.30
Macomb	9.97	10.69	10.89	11.15	10.71	10.80	10.99
Washtenaw	5.68	8.05	7.51	8.17	8.10	8.27	8.08
Monroe	1.34	2.65	2.23	2.46	2.62	2.34	2.33
St. Clair	1.99	2.34	2.59	2.42	2.88	2.57	2.41
Livingston	.81	1.38	1.23	1.75	1.54	2.11	1.64

Oakland and Macomb Counties show slight increases in percentage shares, ranging from 21.60 per cent under Alternative 3 to 23.81 per cent under Alternative 4 for Oakland and 10.69 per cent under Alternative 1 to 11.15 per cent under Alternative 3 for Macomb. These forecast percentage shares compare with an 18.51 percentage share for Oakland and a 9.97 percentage share for Macomb in the base year.

Similarly, Washtenaw County does slightly better in its share of non-basic jobs by year 2000 under all alternatives. Washtenaw increases its percentage share from the 1970 base share of 5.68 per cent to forecast shares ranging from 7.51 per cent for Alternative 2 to 8.27 per cent for Alternative 5.

Monroe, St. Clair and Livingston show small increases in percentage share of regional non-basic jobs, reflecting large absolute changes over relatively small base values. In St. Clair and Livingston Counties, the highest percentage shares in non-basic jobs are found under Alternatives 4 and 5, respectively, parallel to the pattern evidenced in the population results (see Table V-4). This substantiates the linkage in the overall model structure between population shifts and non-basic employment.

Conclusions

Neither Detroit nor any of the counties lose non-basic jobs. Due in part to the larger percentage increase in non-basic employment over population at the regional level, areas showing population decline (e.g., Detroit under all alternatives, Out-Wayne under Alternatives 4 and 5 and Macomb under Alternative 4) do not experience a decrease in non-basic jobs. As noted above, the non-basic jobs tend to shift less to the outlying portions of the region than the basic jobs, while still following the population trends. Where previous basic employment and the availability of vacant land for growth explain the basic employment results, concentrations of population explain the non-basic employment results.

LAND USE

Introduction

This section presents results concerning the land use patterns that each alternative produces in the year 2000. These patterns result from the interaction between the land use policy inputs developed by the Technical Working Group, and the relationships incorporated in the model that influence the location and nature of development. Since each alternative embodies different land use plans and development objectives, it is interesting to note how subsequent development responds to this direction.

To facilitate analysis, land in the region was classed according to its existing land use. Four general land uses were identified: Residential, Developed Non-Residential, Vacant, and Other. The Residential land use category contains all land used for residential purposes. The Developed Non-Residential categories include all land developed for commercial, institutional, or industrial purposes. The Vacant category consists of all vacant and agricultural lands, while the Other category contains the balance: recreational areas, water bodies, and land used for extractive purposes.

Table V-17 presents the amount of land in each of the four land use categories by county in 1970 and 2000. Table V-18 provides the same information by community group. These tables show that the greatest changes in land use patterns occurs in growth areas, with these changes primarily reflecting conversion of vacant land to residential land uses. Consequently, the greatest differences in land use patterns among alternatives appear in those areas that show the greatest range of growth across the alternatives. In general, these areas tend to be the more rural counties and the township areas.

The amount of land classed as Developed Non-Residential increases slightly in all areas under all alternatives. The greatest increases occur in the more urban counties--Out-Wayne, Oakland and Macomb--and among Community Groups 2, 5 and 7. Thus, new commercial, institutional and industrial development continues to concentrate in the fringe of existing urbanized areas within the region, tending to locate in the more populous cities and townships that have the physical facilities and land to accommodate such growth, as well as reasonable accessibility to population centers and transportation networks.

TABLE V-17

YEAR 2000 EXISTING LAND USE BY COUNTY AND ALTERNATIVE

County	Existing Land Use	1970 Base	Alternative 1	2	3	4	5	6
Detroit	Residential	52996	46649	46326	47555	38760	42370	47549
	Developed Non-Residential	22209	22259	21627	21798	22908	21791	21779
	Vacant	6841	13131	14119	12721	20342	17919	12739
	Other	6469	6476	6443	6441	6505	6435	6448
	Total	88515	88515	88515	88515	88515	88515	88515
Out-Wayne	Residential	80778	119060	107135	117241	96589	113696	116633
	Developed Non-Residential	39105	46994	47648	47519	46124	46670	47247
	Vacant	157188	109584	121040	110743	133572	115289	111972
	Other	22774	24207	24022	24342	23560	24190	23993
	Total	299845	299845	299845	299845	299845	299845	299845
Oakland	Residential	105850	220247	184007	207462	152139	253924	213013
	Developed Non-Residential	23518	30361	31105	29259	33229	31775	30752
	Vacant	372783	250630	285511	264685	313838	215492	257539
	Other	70465	71378	71993	71210	73410	71425	71312
	Total	572616	572616	572616	572616	572616	572616	572616
Macomb	Residential	58651	98746	88978	100123	78484	98143	99114
	Developed Non-Residential	21138	26316	26825	27910	26660	27142	27244
	Vacant	214231	168047	177386	164898	187874	167758	166926
	Other	14625	15536	15456	15714	15627	15602	15361
	Total	308645	308645	308645	308645	308645	308645	308645
Washtenaw	Residential	28962	68915	43524	61452	49587	82160	71777
	Developed Non-Residential	13803	17390	16728	17426	17774	17812	17383
	Vacant	383435	339615	365658	346741	357604	325983	336853
	Other	29270	29550	29560	29851	30505	29515	29457
	Total	455470	455470	455470	455470	455470	455470	455470
Monroe	Residential	24762	82733	40420	88052	42300	94617	74539
	Developed Non-Residential	4911	8350	6507	7282	8132	7743	7312
	Vacant	321217	259652	303340	255369	299244	248334	268927
	Other	8726	8881	9349	8913	9940	8922	8838
	Total	359616	359616	359616	359616	359616	359616	359616
St. Clair	Residential	26508	69892	44284	52536	58582	79713	66482
	Developed Non-Residential	12690	13905	13708	13911	14384	13732	13541
	Vacant	395481	350715	376174	368106	359317	341067	354571
	Other	18879	19046	19392	19005	21275	19046	18964
	Total	453558	453558	453558	453558	453558	453558	453558
Livingston	Residential	16357	51403	30244	50414	30248	107771	63683
	Developed Non-Residential	5631	6447	5963	6404	6644	7137	6737
	Vacant	310823	274840	296507	275726	295030	217779	262345
	Other	34653	34774	34750	34920	35542	34777	34699
	Total	367464	367464	367464	367464	367464	367464	367464
REGION	Residential	394864	757645	584918	724835	546689	872394	752790
	Developed Non-Residential	143005	172022	170111	171509	175855	173802	171995
	Vacant	2161999	1766214	1939735	1798989	1966821	1649621	1771872
	Other	205861	209848	210965	210396	216364	209912	209072
	Total	2905729	2905729	2905729	2905729	2905729	2905729	2905729

TABLE V-18

YEAR 2000 EXISTING LAND USE BY COMMUNITY GROUP AND ALTERNATIVE

Community Group	Existing Land Use	1970 Base	Alternative					
			1	2	3	4	5	6
Group 1	Residential	127300	125695	123448	125835	111612	119377	125576
	Developed Non-Residential	47750	50326	50303	50332	51224	50171	50235
	Vacant	20559	19333	21713	19244	32679	25884	19604
	Other	15985	16240	16130	16183	16079	16162	16179
	Total	211594	211594	211594	211594	211594	211594	211594
Group 2	Residential	69619	105631	98030	102419	86634	101907	103007
	Developed Non-Residential	30274	36995	38048	37677	37749	37541	37637
	Vacant	98114	54624	60901	57159	72930	57760	56707
	Other	12521	13278	13549	13273	13215	13320	13177
	Total	210528	210528	210528	210528	210528	210528	210528
Group 3	Residential	10050	10859	10738	10803	10323	10819	10735
	Developed Non-Residential	2804	2934	3000	2963	2956	2985	2964
	Vacant	1596	624	692	657	1145	620	740
	Other	1338	1371	1358	1365	1364	1364	1349
	Total	15788	15788	15788	15788	15788	15788	15788
Group 4	Residential	21120	45298	38940	42724	33880	46651	41327
	Developed Non-Residential	8040	10529	11376	10633	10185	10978	10798
	Vacant	59208	31882	37389	34444	43587	30059	35766
	Other	6889	7548	7552	7456	7605	7569	7366
	Total	95257	95257	95257	95257	95257	95257	95257
Group 5	Residential	75730	166818	136415	151658	117577	167449	167502
	Developed Non-Residential	18882	26683	26795	26526	26982	27194	27072
	Vacant	263812	163655	193433	178619	211341	162444	162687
	Other	40129	41397	41910	41750	42653	41466	41292
	Total	398553	398553	398553	398553	398553	398553	398553
Group 6	Residential	49974	188853	99740	172379	113383	288963	182467
	Developed Non-Residential	13793	16655	14462	15629	18549	17236	15695
	Vacant	1211485	1069533	1160596	1086923	1138900	968814	1076960
	Other	91177	91388	91631	91498	95597	91416	91307
	Total	1366429	1366429	1366429	1366429	1366429	1366429	1366429
Group 7	Residential	41071	114491	77607	119017	73280	137228	122176
	Developed Non-Residential	21462	27900	26127	27749	28210	27697	27594
	Vacant	507225	426563	465011	421943	466239	404040	419408
	Other	37822	38626	38835	38871	39851	38615	38402
	Total	607580	607580	607580	607580	607580	607580	607580
REGION	Residential	394864	757645	584918	724835	546689	872394	752790
	Developed Non-Residential	143005	172022	170111	171509	175855	173802	171995
	Vacant	2161999	1766214	1939735	1798989	1966821	1649621	1771872
	Other	205861	209848	210965	210396	216364	209912	209072
	Total	2905729	2905729	2905729	2905729	2905729	2905729	2905729

The Other category of land uses is unique because of its relationship to residential development. Since the amount of land classified as water bodies and extractive use remains constant under all alternatives, the Other category varies only according to the amount of land used for recreation. Recreation land is used in direct proportion to the density of residential development, suggesting that the amount of land in the Other land use class should vary according to the amount and density of new residential development. This in fact is the case, but the amount of recreation land used under each alternative is very small relative to the total amount of land in the Other land use class. As a result there is little change in the amount of land in this category under any alternative.

Differences Among the Alternatives

The land use patterns resulting from each of the alternatives reflect the influence of the various policies on development. Not only do the total amounts of developed land use classes vary under each alternative, but their relative proportions vary as well.

Alternative 1 represents an interpretation of existing trends in land use policies. It limits non-residential development to 24 acres per analysis zone in unsewered areas and to no more than ten per cent of total vacant land in each analysis zone in sewered areas. Flood plains and wetlands were protected from development, however only 25 per cent of the acreage in each of the remaining sensitive land types was protected. A minimum residential density of 2.5 dwelling units per acre was required for all development in sewered areas, and all uncommitted redevelopment projects scheduled under Alternative 5 were reduced 50 per cent.

Subject to these constraints the model converted over 360,000 acres of vacant land to residential land uses. Compared with the other alternatives, these numbers tend to be high. Only under Alternative 5 were more acres converted to residential land uses, and only Alternatives 4 and 5 converted more acres for the Developed Non-residential uses. These results generally hold at the county and community group levels as well. Further, development occurs so that the amount of land converted to residential uses is a very high proportion of all newly developed land throughout each community group and county in the region. This trend is most pronounced in the cities, while the townships assume a more commercial character.

Alternative 2 incorporates the strongest policies concerning preservation of environmentally sensitive land. The intent of this alternative is to contain development in existing urban areas.minimizing the need for conversion of vacant land to developed land uses. This objective is pursued by limiting sewer extensions to committed projects, requiring sewered residential development to occur at a minimum of eight dwelling units per acre, accelerating all redevelopment projects five years, and protecting all unsewered environmentally sensitive land from development. The net effect of these policies is that the number of acres converted to residential land uses is lower in all alternatives except Alternative 4, and acres converted to commercial, institutional and industrial uses are the lowest of all alternatives.

In general, this alternative achieves its objective of restricting growth to existing urbanized areas. The more rural counties of Washtenaw, Monroe, St. Clair, and Livingston have less acreages of the developed land uses under this alternative than the others. Further, the amount of land developed in the remaining counties is low in comparison with the other alternatives. This result is also apparent at the community group level, where conversion of vacant land to residential land uses is kept to a minimum in the rural townships, while the bulk occurs in the more urbanized townships and the Group 2 cities. Similarly, the greatest conversion of land to the other developed land uses occurs in the cities and large townships.

Because the density of new residential development is so high under this alternative, less land is required for residential purposes. Therefore, the existing residential land use is more intensive. Since the land requirements of industry and commerce are fairly constant among all alternatives, the relative proportion of these land uses compared with the residential land uses is quite high for this alternative.

Alternative 3 was formulated to depict the existing land use plans and policies of the counties in the region. All but two counties developed policy inputs that differed from the existing plans of the local governments within their jurisdictions. Out-Wayne and Macomb Counties presented policies for this alternative that were the same as those used for Alternative 5. Because of the variation among county policies, the land use patterns that result are best viewed at the county level.

Of the alternatives that allow lower density sewered development, this alternative requires the least amount of land for residential, commercial, and industrial land uses. This is due to the relatively lower requirements for developed land uses in Oakland, Washtenaw, St. Clair, and Livingston Counties. Wayne, Macomb and Monroe Counties offset this pattern in that they convert more land to these uses under this alternative than the average for other alternatives. The net result is that the land use patterns in each county shifts more towards residential land use in proportion to commercial and industrial development.

In the more urbanized areas, Alternative 3 tends to convert more land to Developed Non-Residential land uses in proportion to residential land uses. Among the townships this trend is reversed. Thus, commercial and industrial development is more centralized under this alternative.

Alternative 4 places minimal constraints on development in the form of land use plans or policies. More than ample room is afforded for commercial, institutional and industrial development in all areas within the region. Although no land is protected from development, all new residential construction is built at a minimum density of eight dwelling units per acre.

Due to the high average density of new development, the least acres of vacant land are converted to residential land uses under this alternative. On the other hand, the liberal policies concerning the location of nonresidential development result in the highest conversion of land for this purpose of all alternatives. New non-residential development occurs mostly in the township areas under this alternative, located predominantly in the more rural townships. A fairly substantial amount of non-residential development also occurs in the Group 2 cities, but the overall tendency is for the outlying areas to become more urbanized in comparison with existing urban areas. These same patterns are apparent at the county level as well.

Alternative 5 was designed to reflect the land use plans of local governments in the region. It is second only to Alternative 4 in terms of the total number of acres that are scheduled to be sewered. Like Alternative 4, no provison is made to protect environmentally sensitive land aside from those already incorporated in the plans of local governments. This alternative also allows residential development on sewered land to occur at the lowest densities of any alternative. The combination of these factors produces the greatest conversion of land to residential land uses of all the alternatives.

Under this alternative, the greatest conversion of land to residential land uses occurs in Oakland, Livingston and Monroe Counties, and in the rural townships. Again, as with Alternative 4, new industrial and commercial development is spread out into the townships and small towns in rural areas. Thus, the larger urbanized areas become more residential in character relative to the developing areas in the region.

Alternative 6, which represents the land use policies of the Council, is much like Alternatives 1 and 3. Residential land use patterns in the townships under this alternative are almost identical to those found under Alternative 1, while those in the cities are closer to those found under Alternative 3. Commercial, institutional and industrial land uses follow precisely the opposite patterns. The net effect is that the developing areas in the region are more residential in character compared with Alternatives 1 and 3, while existing urban areas gain more in non-residential development.

FOOTNOTES: CHAPTER V

[1] From Curt Harris Regional Control Totals.

[2] The totals vary slightly between the alternatives due to rounding.

CHAPTER VI: EVALUATION MEASURES

INTRODUCTION

The results presented in the preceding chapter follow from the various public policies incorporated in the six alternatives. The patterns of regional growth that are produced by the model are consequences of the distribution and characteristics of land available for development. The distribution of growth, however, has secondary impacts that affect the quality of life in the region. These impacts should be considered in conjunction with the results presented in Chapter V, where each of the alternatives are compared.

Several measures of these secondary impacts have been developed to aid the evaluation of each alternative. These measures fall into two general categories. The first set includes measures of the fiscal impacts of the alternatives. The impacts are reflected here in terms of estimates of the public and private costs associated with the various patterns of development resulting from each alternative. In the first section of this chapter, estimates of some of the public and private costs associated with each alternative will be presented. The public costs of new school construction and the extension of sewer lines to growing areas will be discussed first. Then, the private costs incurred preparing land for development will be presented. These costs include the costs of connecting lots in a development with trunk sewer and water lines, and the construction of roads within the development.

The second set of evaluation measures to be discussed concerns the environmental impacts of each of the alternatives. These measures indicate how each alternative affects air and water quality, energy consumption, and environmentally sensitive lands. They are presented in the second section of this chapter for each alternative.

The evaluation measures in this chapter provide a means to compare each of the alternatives. While each measure was carefully developed to present a particular impact, the values of these measures are not meant to be considered actual forecasts themselves. Such accuracy would have required a separate modeling effort. Instead, these measures embody approximate, but reasonable, assumptions about impacts, and these assumptions remain the same for each alternative. Thus, while the measures are not predictions of the actual impacts themselves, they do enable comparison of the impacts among alternatives.

SCHOOL COSTS

A school cost measure was developed for the purpose of evaluating the impact of changes in the geographic distribution in school-age children under the six policy alternatives. Change in the number of school-age children was calculated for each Minor Civil Division (MCD) from the 1970 base and year 2000 results for each alternative. For areas experiencing net positive change or growth in school-age children, both the absolute number and the cost of new classrooms were estimated; for areas experiencing negative change or decline in school-age children, both the number of unused classrooms and the displacement cost associated with their disuse were calculated. The same dollar cost per classroom was used to calculate the cost of new classroom construction and the replacement value of unused classrooms. The rationale behind this methodology is that idle classrooms in one area of the region may require new construction of classrooms in some other area of the region. Thus, both figures are given to indicate the cost and location of new construction and the abandonment of existing facilities.

School Costs: Regionwide

Table VI-1 presents the results from the school cost calculations by county for all six alternatives. Focusing first on the total regional costs for new and unused classrooms associated with each of the alternatives, the following observations can be made: 1) the value of the unused classrooms in all cases exceeds the cost for the new classrooms, 2) the ranking of the alternatives is the same for both new construction and abandonment, and 3) the highest school cost alternative, Alternative 4, represents almost double the costs of the lowest school cost alternative, Alternative 3.

The high value of unused classrooms under all alternatives reflects the fact that the number of school age children are forecast to decline in the region between 1970 and 2000 by 191,520, as can be seen in Table VI-1.

Applying the cost per classroom estimates to the regional forecast decline results in a regional value for unused classrooms of slightly over $1,046,000,000 under all alternatives. The cost associated with an overall regional decline in the number of school-age children constitutes the difference between the regional totals for the value of unused classrooms and the cost of new classrooms. Thus, the ranking of the alternatives for both of these evaluative measures at the regional level is the same.

School Costs: County Comparison

Shifting to the county level results presented in Table VI-1, it is apparent that, in general, high construction costs for new schools is associated with overall population growth. Thus, under Alternative 4, Washtenaw, Monroe and St. Clair Counties experience the highest costs for new construction, which parallels the shift in regional population into the more rural counties. In contrast, the highest new school cost for Wayne County occurs under Alternative 2, where growth concentrates in the near suburbs.

TABLE VI-1

CHANGE IN CLASSROOMS FROM 1970 TO YEAR 2000, AND ASSOCIATED CAPITAL COSTS BY COUNTY

County	Classrooms	Alternative 1	2	3	4	5	6
Detroit	Unused	6186	6377	5637	9284	7375	5737
	New	0	0	0	0	0	0
	Value Unused[1]	936.64	965.06	854.76	1399.80	1115.01	869.44
	Cost New[1]	0	0	0	0	0	0
Out-Wayne	Unused	4474	4834	4529	6680	5004	4628
	New	1657	1996	1565	1010	1242	1444
	Value Unused	667.73	721.37	676.08	997.00	747.18	690.88
	Cost New	249.86	300.37	235.90	151.67	187.44	217.67
Oakland	Unused	2853	2329	2992	3969	3025	2720
	New	1643	2436	1391	2325	2498	1645
	Value Unused	427.15	348.96	448.05	593.70	452.70	407.15
	Cost New	247.87	366.91	209.56	350.25	376.03	247.83
Macomb	Unused	2472	2412	2408	3503	2645	2479
	New	1311	1254	1411	1240	1056	1105
	Value Unused	362.66	355.32	353.81	514.87	388.18	363.84
	Cost New	199.64	191.98	215.34	169.18	161.31	169.19
Washtenaw	Unused	293	273	210	523	253	229
	New	1576	1217	1855	3147	1912	1706
	Value Unused	51.07	46.94	35.92	86.69	44.04	39.72
	Cost New	232.77	177.93	272.08	468.91	281.97	250.39
Monroe	Unused	71	73	67	89	72	75
	New	1483	1050	1251	2032	1253	837
	Value Unused	10.74	10.91	10.05	10.73	10.72	11.26
	Cost New	222.75	157.80	188.08	304.60	188.28	126.44
St. Clair	Unused	173	195	165	285	164	166
	New	987	1119	821	5758	1232	898
	Value Unused	26.23	29.45	24.95	42.99	24.81	25.13
	Cost New	147.71	167.81	123.11	861.86	184.58	134.55
Livingston	Unused	0	0	0	0	0	0
	New	928	469	774	1884	2404	1464
	Value Unused	0	0	0	0	0	0
	Cost New	138.41	69.67	115.99	281.41	359.30	218.52
REGION	Unused	16522	16493	16008	24333	18538	16034
	New	9585	9541	9068	17396	11597	9099
	Value Unused	2482.22	2478.01	2403.62	3648.14	2782.65	2407.42
	Cost New	1439.01	1432.47	1360.06	2604.99	1738.91	1364.58

[1] = In Millions of Dollars

(For Comparison Purposes Only)

The lack of a perfect parallel between population growth and new school cost is demonstrated for Oakland County, which has the highest costs for new schools under Alternative 5, but the largest overall population growth under Alternative 2. Cost for new schools even at the county level is a reflection both of population growth and the shifting of existing population between areas within a county.

Alternative 4 ranks highest in the cost associated with unused classrooms in all but Livingston County. The unused classroom measures graphically demonstrate the impact of the public policies of Alternative 4 on the utilization of existing school facilities. The high cost of population shifts occurring under this alternative, from the more established areas to largely vacant areas, is demonstrated by this measure.

PUBLIC CAPITAL COSTS

Associated with most private residential development are public costs for sanitary sewers, storm drains, water lines, water and sewage treatment plants, and road construction to relieve traffic congestion due to the new growth. In general, these costs tend to be lower when land is developed at a high density, close to existing urban areas. It was not possible to develop estimates for all of these costs for this report. However, additional analysis of the public costs of each alternative will appear in a subsequent report. As an illustration of how public costs may vary by alternative, the costs of providing publicly financed sewer lines to areas of new development were calculated. Other public costs may not follow an identical pattern, but the general principles discussed in this section still apply.

The public costs associated with the construction of sewer lines are restricted to expenditures required to transmit sewage to treatment plants or interceptors. They are based on the sewering plans proposed by the Technical Working Group for each alternative, from 1975 to 2000. These costs appear in Table VI-2 by county and Table VI-3 by community group. They do not include the private costs of connecting a residence to a sewer main or the cost of any sewer lines installed by a private developer . They also do not include the public costs of expanding sewage treatment facilities or pumping stations.

The requirements for new construction of sanitary sewer lines are directly related to the size of the population the new lines are expected to serve, and the distance of the new development from existing sewage collectors. As the size of the service population increases, the volume of sewage it generates also increases, and larger diameter pipe lines are needed to accommodate the population. Economies of scale exist such that larger diameter pipes, which have the capacity to serve a larger population cost less per capita than smaller lines. As the distance from existing lines increases, additional pipe is needed to span the distance between new development and sewage collectors. Thus new development that is constructed at a high density, close to existing sewered development, costs less per capita to sewer than low density development in rural townships.

TABLE VI-2

TOTAL PUBLIC COSTS OF NEW SEWERS BY COUNTY
(In Thousands of Dollars)

(For Comparison Purposes Only)

	Alternative					
County	1	2	3	4	5	6
Detroit	0.	0.	0.	0.	0.	0.
Out-Wayne	2290.3	1898.2	1978.7	5314.5	2229.4	1780.6
Oakland	6061.4	3409.7	4997.6	52211.8	12708.5	4683.4
Macomb	8516.7	3733.0	9529.0	27917.5	9568.6	6753.1
Washtenaw	8104.6	2193.8	8734.2	60114.5	9537.8	7096.2
Monroe	7395.4	3109.9	6638.1	35179.8	6251.4	5227.3
St. Clair	7872.9	4873.5	5950.3	70747.6	6473.3	2794.3
Livingston	6030.6	2679.3	5439.3	52445.0	8390.0	4788.9
REGION	46271.9	21897.4	43267.2	303930.7	55159.0	33123.8

TABLE VI-3

TOTAL PUBLIC COSTS OF NEW SEWERS BY COMMUNITY GROUP

(In Thousands of Dollars)

(For Comparison Purposes Only)

Community Group	Alternative 1	2	3	4	5	6
Group 1	0.	0.	0.	0.	0.	0.
Group 2	451.5	406.6	459.4	604.7	467.3	419.8
Group 3	39.6	0.	39.6	79.2	39.6	0.
Group 4	2195.1	926.7	2213.6	4802.1	1970.7	1531.2
Group 5	7314.2	4406.3	7162.3	16724.0	8093.0	7075.2
Group 6	16207.9	6158.7	11660.3	208446.7	20133.0	6431.1
Group 7	20063.6	9999.1	21732.0	73274.0	24455.4	17666.5
REGION	46271.9	21897.4	43267.2	303930.7	55159.0	33123.8

The results of this analysis indicate that there is substantial variation in public sewer costs among the six alternatives. For the region as a whole, Alternative 2 requires the least new investment, a total of $21,897,400 as seen in Table VI-2. The most costly is Alternative 4 which would require over three hundred million dollars of public investment. The remaining alternatives fall within a cost range of 30 to 60 million dollars.

The costs of new sewer lines within the region are higher in the townships which lie further from existing lines. The amount of investment required in these areas varies considerably. This reflects the range of population that settles in these areas under each alternative as well as the density of development. Alternatives 2 and 3 concentrate the most growth in the larger urban areas where existing sewer lines have enough capacity to accommodate the growth with minimum new construction. This means fewer households located in areas that are currently unsewered, reducing investment outside the more urbanized areas.

Although Alternatives 2 and 3 produce the highest concentration of regional population in the large cities, Alternative 3 is twice as costly as Alternative 2. This is due to the low cost of the higher density development that occurs under Alternative 2. These results suggest that the density of new development is more critical in reducing public sewer line costs than encouraging development where existing lines can support growth. Alternative 4 appears to contradict this conclusion because it sewers land at a very high density, and is ten times as costly as Alternative 2. This discrepancy is due in part to the fact that the entire region is considered sewered under Alternative 4. A similar assumption would make Alternative 2 equally as costly.

At the county level, Alternative 2 emerges as the least cost alternative in all counties but Wayne. Alternative 6, which requires the least investment after Alternative 2, generates the least costs in Wayne County. In general, the total cost of each alternative is distributed fairly evenly among the counties. Detroit, which has sewer lines serving all vacant land already, requires no investment under all alternatives. Of the counties, the least investment is required in Out-Wayne in every case, while Oakland, Macomb, and Washtenaw Counties tend to require more investment than the other counties under most alternatives.

PRIVATE CAPITAL COSTS

The policies reflected in the six alternatives are likely to have a significant impact on private development costs. This is especially true for costs that vary according to the density of development, such as constructing subdivision roads and constructing sewer and water lines to serve the proposed development. While these costs are typically borne by private developers, they directly affect the cost of new housing to the consumer.

In general, the cost of preparing a site for development falls as development occurs at higher densities. The lower costs are due to shorter distances involved in connecting smaller lots to sewer and water lines. In areas where septic fields are used, the costs of extending sewer and water lines are nonexistent, but the cost of road construction remains. Here, costs per lot decline with density for two reasons. First, it is assumed that development at densities between 0.1 and 1.0 dwelling units per acre is served by gravel roads rather than paved roads. Second, development at densities less than 0.1 dwelling units per acre is assumed to occur on the frontage of existing roads.

Tables VI-4 and VI-5 present the private capital costs for roads, sanitary sewers, and water mains by county and community group for each alternative. Private capital costs vary among alternatives according to the amount of new construction completed under each alternative, and the average density at which it is built. Alternative 4 produces the most new construction totaling 1,000,919 new dwelling units during the forecast period. These require an average private capital investment in roads, sewers, and water mains of $2,836.50 per dwelling unit, or a total investment of 2.839 billion dollars. The least total investment of 2.486 billion dollars occurs under Alternative 2 which produces 867,966 new dwelling units.

The least amount of new construction occurs under Alternative 3 with an average private capital investment of $3,940.30 per dwelling unit. Even though fewer units are constructed, the total private investment exceeds that of Alternative 2 by nearly $800 million dollars. This is due to the lower average density of development that occurs under Alternative 3. The remaining alternatives produce moderate amounts of new construction compared with the others. But because the average density of new development is low, the alternatives have much greater requirements for private investment, ranging as high as a total of 3.996 billion dollars.

Alternatives 2 and 4 require the least amount of private investment because of the high density of development that they encourage. Under both alternatives all development in sewered areas occurs at a minimum density of eight dwelling units per acre. Since private capital cost decrease as density increases, these alternatives require less capital investment than others, where development densities may be 2.5 dwelling units per acre or lower. The fact that the entire region is considered sewered under Alternative 4 means that no non-sewered development takes place under this alternative. Although non-sewered development is inexpensive at very low densities, development at one dwelling unit per acre is more expensive than development at eight dwelling units per acre. This is because the higher costs of developing an acre of land at the higher density ranges are shared by eight or more dwelling units. Thus Alternative 4 has the capacity to achieve some savings in this respect. Alternative 2 also minimizes the cost of low density development by protecting non-sewered land from development. Non-sewered development still takes place under this alternative but at less cost than other alternatives.

How the distribution of costs across community groups varies with alternative provides additional insight into the total private cost of each alternative. Figure VI-1 and VI-2 show the distribution of private costs by county and community group, respectively. Under Alternative 1, 60 per cent of new housing construction occurs in the townships where the

TABLE VI-4

PRIVATE CAPITAL COSTS BY COUNTY

(In Millions of Dollars)

(For Comparison Purposes Only)

County	Measure	Alternative 1	2	3	4	5	6
Detroit	Sewers	20.37	25.87	28.86	8.92	17.27	28.53
	Water Mains	12.04	15.23	17.06	5.37	10.15	16.86
	Roads	54.21	68.64	76.89	24.09	45.71	75.96
	Total	86.62	109.74	122.81	38.38	73.13	121.35
Out-Wayne	Sewers	192.36	125.07	179.35	80.30	162.67	178.79
	Water Mains	118.67	76.32	110.21	49.08	99.95	110.32
	Roads	340.23	314.69	309.06	195.33	272.22	306.52
	Total	651.26	516.08	598.62	324.71	534.84	595.63
Oakland	Sewers	161.44	117.35	115.40	122.40	188.01	164.23
	Water Mains	106.69	73.35	75.62	75.61	123.46	109.14
	Roads	718.37	609.92	603.35	478.11	884.50	770.50
	Total	986.50	800.62	794.37	676.12	1195.97	1043.87
Macomb	Sewers	151.21	81.98	148.90	74.17	134.98	142.88
	Water Mains	95.94	49.94	93.90	45.15	85.20	91.12
	Roads	330.34	259.19	320.63	208.81	297.11	323.52
	Total	577.49	391.11	563.43	328.13	517.29	557.52
Washtenaw	Sewers	84.20	46.67	67.02	86.80	90.81	98.40
	Water Mains	54.24	28.51	40.96	53.14	57.58	63.34
	Roads	305.47	143.53	219.22	249.29	344.97	337.66
	Total	443.91	218.71	327.20	389.23	493.36	499.40
Monroe	Sewers	97.34	34.70	77.08	59.74	77.23	72.50
	Water Mains	66.58	21.21	50.22	36.53	50.06	47.70
	Roads	362.83	121.61	273.82	185.43	284.99	261.71
	Total	526.75	177.52	401.12	281.70	412.28	381.91
St. Clair	Sewers	57.24	34.35	61.61	133.08	66.41	49.39
	Water Mains	37.66	20.92	40.27	81.20	42.91	31.53
	Roads	191.48	134.24	162.16	372.43	223.44	181.90
	Total	286.38	189.51	264.04	586.71	332.76	262.82
Livingston	Sewers	13.17	6.43	18.32	41.40	33.69	21.22
	Water Mains	8.69	3.92	12.02	25.26	22.66	14.31
	Roads	151.43	72.29	181.77	147.56	379.79	298.40
	Total	173.29	82.64	212.11	214.22	436.14	333.93
REGION	Sewers	777.23	472.42	696.54	606.81	771.07	755.94
	Water Mains	500.51	289.40	440.26	371.34	491.97	484.32
	Roads	2454.36	1724.11	2146.90	1861.05	2732.73	2556.17
	Total	3732.20	2485.93	3283.70	2839.20	3995.77	3796.43

TABLE VI-5

PRIVATE CAPITAL COSTS
BY COMMUNITY GROUP
(In Millions of Dollars)

(For Comparison Purposes Only)

Community Group	Measure	Alternative 1	2	3	4	5	6
Group 1	Sewers	52.02	50.79	57.12	21.31	42.01	56.34
	Water Mains	31.35	30.46	34.21	12.96	25.15	33.71
	Roads	122.62	141.70	140.59	62.65	101.75	139.53
	Total	205.99	222.95	231.92	96.92	168.91	229.58
Group 2	Sewers	177.78	121.17	156.23	79.09	161.19	173.91
	Water Mains	113.29	75.15	98.56	48.79	102.32	110.85
	Roads	394.44	328.45	342.08	219.18	359.77	385.77
	Total	685.51	524.77	596.87	347.06	623.28	670.53
Group 3	Sewers	3.22	2.54	3.40	1.77	3.73	3.18
	Water Mains	2.00	1.54	2.10	1.08	2.33	1.97
	Roads	7.58	7.36	7.81	5.68	8.92	7.35
	Total	12.80	11.44	13.31	8.53	14.98	12.50
Group 4	Sewers	73.18	52.46	64.13	42.01	67.97	61.72
	Water Mains	46.28	32.02	40.23	25.62	42.57	39.07
	Roads	206.13	162.99	176.50	121.56	189.17	175.92
	Total	325.59	247.47	280.86	189.19	299.71	276.71
Group 5	Sewers	244.36	144.83	205.24	122.81	245.79	245.91
	Water Mains	158.12	88.82	130.56	75.42	158.20	159.26
	Roads	702.49	530.33	571.56	408.01	716.60	709.15
	Total	1104.97	763.98	907.36	606.24	1120.59	1114.32
Group 6	Sewers	60.36	22.06	39.12	228.40	65.16	31.99
	Water Mains	42.08	13.46	25.95	139.36	43.22	21.51
	Roads	516.43	263.83	408.62	700.14	757.86	548.65
	Total	618.87	299.35	473.69	1067.90	866.24	602.15
Group 7	Sewers	166.42	78.58	171.29	111.43	185.22	182.87
	Water Mains	107.38	47.96	108.67	68.12	118.16	117.96
	Roads	504.67	289.45	499.75	343.82	598.66	589.81
	Total	778.47	415.99	779.71	523.37	902.04	890.64
REGION	Sewers	777.34	472.43	696.53	606.82	771.07	755.92
	Water Mains	500.50	289.41	440.28	371.35	491.95	484.33
	Roads	2454.36	1724.11	2146.91	1861.04	2732.73	2556.18
	Total	3732.20	2485.95	3283.72	2839.21	3995.75	3796.43

FIGURE VI-1
TOTAL PRIVATE CAPITAL COSTS BY COMMUNITY GROUP AND ALTERNATIVE

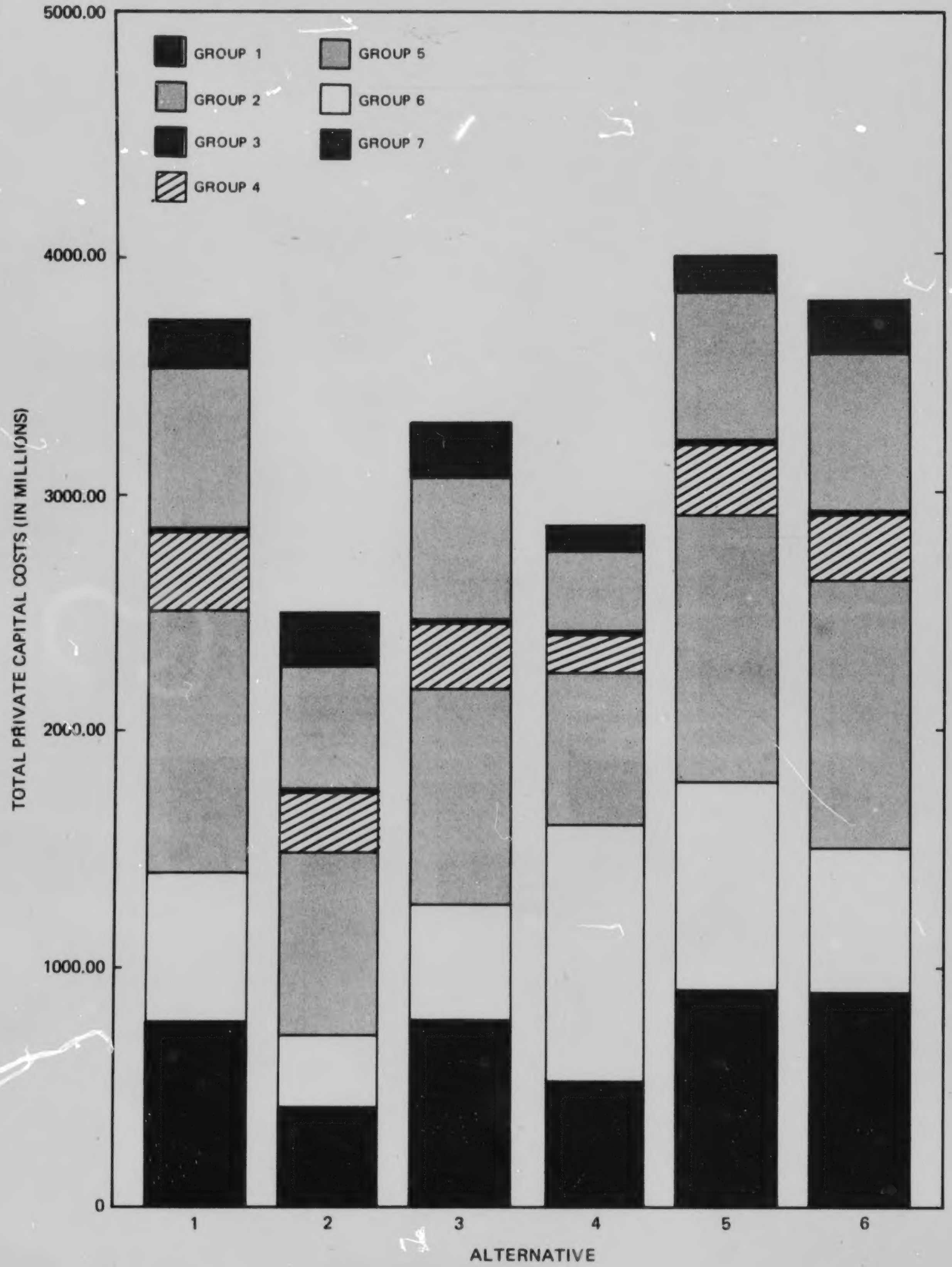
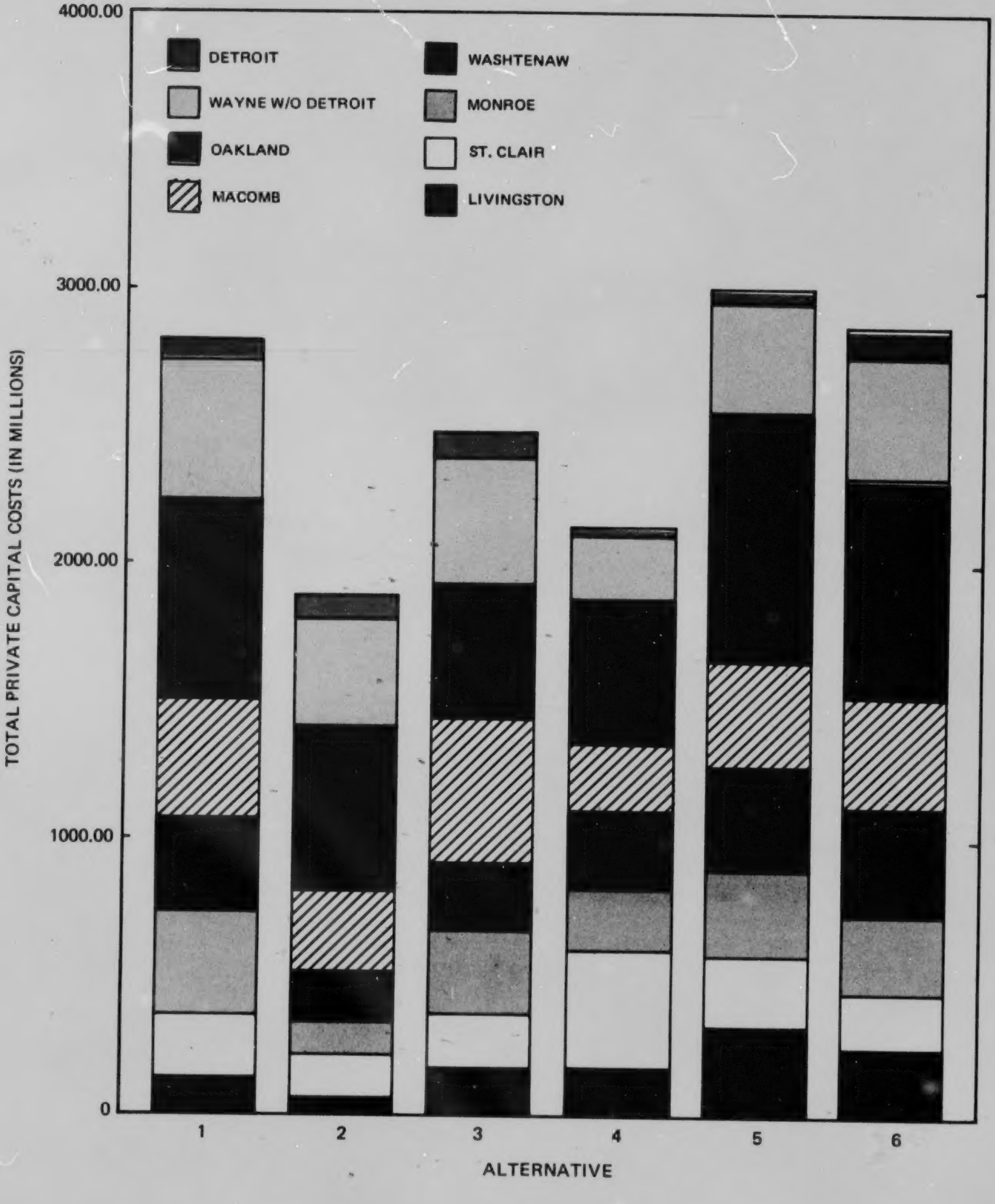


FIGURE VI-2
TOTAL PRIVATE CAPITAL COSTS BY COUNTY AND ALTERNATIVE



average private investment per unit ranges $4,728 to $5,104. These costs are well in excess of the cost of development occurring in the more urbanized areas under this alternative. Alternative 6 follows an almost identical pattern except that the private capital costs associated with development in the townships are even higher, ranging from $4,979 to $5,244 per dwelling unit. The high costs of Alternative 5 are not due to high costs per dwelling, but rather to a high concentration of new construction in the townships, where development is less dense, and therefore more costly. While private development costs per unit in these areas range between $4,526 to $4,989, 67 per cent of all development occurs in these areas, while 42 per cent occurs in the smallest townships alone.

CONVERSION OF ENVIRONMENTALLY SENSITIVE LAND

In the course of urban development, agricultural land, and other land that has value as a natural area, is developed for residential, commercial, and industrial purposes. The amount of this land that is developed under each alternative depends on how much new development occurs, and where it is located. Policies which encourage development in existing urban areas and which promote high density residential development in general, tend to develop less sensitive land than other alternatives.

In addition to policies concerning development patterns, three of the six alternatives, numbers 1, 2 and 6, incorporate regional policies developed by the Technical Working Group that protect environmentally sensitive land from development. This is accomplished by actually removing fixed proportions of this land from land considered available for development, as described in Chapter IV. A fourth alternative, number 3, includes separate provisions made by county governments which only allows development to occur in environmentally sensitive areas at very low densities. This provision has the effect of protecting some of the land in these areas.

Alternative 2 provides for the greatest protection of land, preserving 100 per cent of all environmentally sensitive land that is not scheduled to be sewered. Both Alternatives 1 and 6 protect floodplains and wetlands from further development, but preserve less of the other sensitive land types. Twenty five per cent of this land is protected under Alternative 1 and 50 per cent under Alternative 6. No percentages were set under Alternative 3, and land is protected according to the judgment of each county. Under all alternatives the amount of sensitive land developed varies according to the total amount of land developed in addition to the amount that is protected.

The conversion of three classes of land types to developed land uses is presented in Table VI-6 by county and in Table VI-7 by community group. The first class, Water-Related Land, includes flood plains, wetlands and shores. The Agricultural class includes three grades of agricultural land, and the class, Other Sensitive Land, includes woodlands, areas with a slope in excess of 12 per cent, and other sensitive land that does not fall in the other categories.

TABLE VI-6

1970 SENSITIVE LAND CONVERTED BY 2000 BY COUNTY
(In Acres)

County	Land Type	1970* Base	Alternative 1	2	3	4	5	6
Detroit	Water-Related	0	0	0	0	0	0	0
	Other Sensitive	0	0	0	0	0	0	0
	Agriculture	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
Out-Wayne	Water-Related	4833	408	443	1203	668	1077	492
	Other Sensitive	24238	6922	5112	6946	3643	6157	6542
	Agriculture	101108	27868	20586	27313	14849	24587	27387
	Total	130179	35198	26141	35462	19160	31821	34421
Oakland	Water-Related	41013	2350	2518	1563	5759	15595	2050
	Other Sensitive	59601	21548	14567	26603	11493	26405	20810
	Agriculture	134218	37246	12244	10706	17694	56630	35452
	Total	234832	61144	29329	38872	34946	98630	58312
Macomb	Water-Related	10771	267	300	1508	1003	1429	399
	Other Sensitive	13644	1958	1034	2339	1212	2169	2061
	Agriculture	118439	13619	7183	15508	9308	14866	14665
	Total	142854	15844	8517	19355	11523	18464	17125
Washtenaw	Water-Related	15222	255	150	822	794	1401	299
	Other Sensitive	56699	5235	1563	4375	3375	6562	5379
	Agriculture	307588	37846	15283	31376	21959	49169	40486
	Total	379509	43336	16996	36573	26128	57132	46164
Monroe	Water-Related	40652	834	850	284	3367	8421	869
	Other Sensitive	25949	5998	1815	6609	1665	6312	5360
	Agriculture	250596	53515	13120	57865	16475	57012	44794
	Total	317197	60347	15785	64758	21507	71745	51023
St. Clair	Water-Related	22787	744	566	957	2578	2521	786
	Other Sensitive	44532	5260	2208	4051	4165	6467	4009
	Agriculture	291277	29393	6205	17168	24797	36656	25066
	Total	358596	35397	8979	22176	31540	45644	29861
Livingston	Water-Related	41342	336	294	64	1595	5377	280
	Other Sensitive	83733	10978	3189	2635	4494	26188	13080
	Agriculture	179838	23454	6202	28080	9557	59415	33102
	Total	304913	34768	9685	30779	15646	90980	46462
REGION	Water-Related	176620	5194	5121	6401	15764	35821	5175
	Other Sensitive	308396	57899	29488	53558	30047	80260	57241
	Agriculture	1383064	222941	80823	188016	114639	298335	220952
	Total	1868080	286034	115432	247975	160450	414416	283368

*1970 base from Alternative 5

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TABLE VI-7

1970 SENSITIVE LAND CONVERTED BY 2000 BY COMMUNITY GROUP
(In Acres)

Community Group	Land Type	1970* Base	Alternative 1	2	3	4	5	6
Group 1	Water-Related	307	31	30	213	136	201	39
	Other Sensitive	788	395	321	322	244	302	318
	Agriculture	1307	453	452	474	390	409	471
	Total	2402	879	803	1009	770	912	828
Group 2	Water-Related	4814	472	869	491	1526	2057	487
	Other Sensitive	15357	7238	6255	6547	4470	6770	7055
	Agriculture	18660	6340	4930	5690	3682	5636	6377
	Total	38831	14050	12054	12728	9678	14463	13919
Group 3	Water-Related	261	7	0	20	55	162	7
	Other Sensitive	246	209	177	187	90	180	185
	Agriculture	378	289	276	290	282	289	259
	Total	805	505	453	497	427	631	451
Group 4	Water-Related	7229	487	619	536	1499	2861	518
	Other Sensitive	8374	4114	3547	4590	2408	4568	3742
	Agriculture	26187	13438	8792	9918	6717	12705	11629
	Total	41790	18039	12958	15044	10624	20134	15889
Group 5	Water-Related	27886	2172	2039	2227	4683	10220	2089
	Other Sensitive	38682	14730	9335	14291	7310	14234	14989
	Agriculture	135998	48143	27259	34619	24920	45736	47462
	Total	202566	65045	38633	51137	36913	70190	64540
Group 6	Water-Related	96640	895	630	670	4538	14140	786
	Other Sensitive	172675	18653	4523	16030	9296	38496	17249
	Agriculture	856022	99806	17766	82218	52634	165768	94906
	Total	1125337	119354	22919	98918	66468	218404	112941
Group 7	Water-Related	39483	1130	934	2244	3327	6180	1249
	Other Sensitive	72274	12560	5330	11591	6229	15710	13703
	Agriculture	344512	54472	21348	54807	26014	67792	59848
	Total	456269	68162	27612	68642	35570	89682	74800
REGION	Water-Related	176620	5194	5121	6401	15764	35821	5175
	Other Sensitive	308396	57899	29488	53558	30047	80260	57241
	Agriculture	1383064	222941	80823	188016	114639	298335	220952
	Total	1868080	286034	115432	247975	160450	414416	283368

*1970 base from Alternative 5

Region-wide, the least amount of sensitive land is developed under Alternative 2, and the most is developed under Alternative 5. Without any policy concerning sensitive land, Alternative 4 develops less than Alternatives 1, 3 and 6. This reflects the fact that the high density development occurring under Alternative 4 requires less land over-all than the other alternatives, and consequently less sensitive land. The high density development occurring under Alternative 2 would have had a similar effect without any protection policies, however an additional 45,000 acres of sensitive land were protected from development. Further, Alternative 2, and the other alternatives with protection policies, converted much less water-related land than Alternative 4.

At the county level most of the undeveloped sensitive land in 1970 was located in Washtenaw, Monroe, St. Clair and Livingston Counties. Each of these counties had more than 300,000 acres of sensitive land while the other counties had a total of 500,000 acres. In absolute terms, the most sensitive land was converted in Oakland County under nearly all alternatives,while Macomb County generally converted the least amount.

Wayne County had the least amount of sensitive land of all counties in 1970. Yet a sizeable proportion of new development occurs in this county under all alternatives. In percentage terms the county shows the highest rate of sensitive land conversion in the region, but in absolute terms, the number of acres converted is comparatively low.

Since the policies for Wayne and Macomb Counties are essentially the same under Alternatives 3 and 5, it is interesting to note that the conversion of sensitive land differs under each alternative. This is again a reflection of the population distribution resulting from the two alternatives which produce more development in these counties under Alternative 3. Since no protection policies apply in either county under either alternative, the increased development produced by Alternative 3 results in greater development of environmentally sensitive land in both counties.

In the rest of the counties, Alternative 5 produces the most conversion of sensitive land types. This is due to the low density of the development that occurs under this alternative, and to the fact that no protection policies existed for this alternative. Conversion of water-related sensitive land is particularly high relative to the other alternatives, indicating that much development takes place in flood plains and wetlands.

A comparison of Alternative 3 with the other alternatives that have protection policies reveals that each county policy places different emphasis on protection of specific sensitive land classes. The policies in Oakland County protect the most agricultural and water-related land while allowing more development to occur on other sensitive land types. The policies of Washtenaw County protect more agricultural land and other sensitive land types, but allow much more development to occur on water-related sensitive land. Monroe County limits development of water-related sensitive land.

However, fewer acres of the remaining sensitive land types are protected under Alternative 3 than any other alternative. St. Clair County places a greater emphasis on the protection of agricultural land than the other protection policies, and less emphasis on the protection of water-related land. Livingston County is an anomaly in that more sensitive land is consumed under the more stringent protection afforded through Alternative 6 than under Alternatives 1 or 3. Here again, this may be explained by shifts in the distribution of new construction among the alternatives, with more growth occurring under Alternative 6 than under the other two alternatives.

Among community groups, the conversion of sensitive land follows the same basic pattern throughout all alternatives. In absolute terms, Group 3 communities develop the least amount of land, followed by Groups 1, 2 and 4. However in percentage terms this relationship is reversed, simply because the bulk of the environmentally sensitive land in the region is located in the townships. Among the townships, the most conversion of sensitive land occurs in Group 6 for all but Alternatives 1 and 2 while the least occurs in Group 5 townships in all but Alternatives 2 and 4. Any differences at this level among alternatives are due primarily to the distribution of new construction under each alternative.

RESIDENTIAL ENERGY CONSUMPTION AND EMISSIONS

Residential consumption accounts for a significant proportion of energy requirements in the region. Much of this energy is used by single family homes, which are more energy-consumptive per household than duplex, triplex and other multifamily units. For this reason, policies which promote higher density development than others would be expected to require less energy.

In order to determine how much energy savings could result from each of the alternatives, the energy useage of four types of dwelling units was calculated for the region. First, the number of dwelling units that were mobile homes, single family homes, two family homes, and multifamily homes were estimated for each MCD in the year 2000. These figures were then summed to the regional level where energy useage by fuel source was estimated for each group. Three fuel sources were considered -- electricity, fuel oil, and natural gas. The results are presented in Table VI-8 by alternative in British Thermal Units (BTUs).

This analysis indicates that Alternative 4 requires the most energy, with total regional usage in excess of 64.7 trillion BTUs. Alternative 2 requires the least energy for single family homes, but requires more energy in the multifamily groups. Alternative 5 requires the greatest amount of energy for single family homes, but shows the least requirements for multifamily homes.

Table VI-9 through VI-13 present emission estimates based on the residential energy usage figures from Table VI-8. Emissions are estimated in millions of pounds for carbon monoxide, total suspended particulates, sulfur oxide, nitrogen oxide and hydrocarbons. As might be expected from the analysis of Table VI-8, Alternative 4 ranks highest and Alternative 3 lowest for all the emissions.

TABLE VI-8
YEAR 2000 RESIDENTIAL ENERGY USAGE BY DWELLING UNIT TYPE
(In Trillions of BTUs)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	.080	.057	.391	.528
	1-Family	7.761	4.825	36.273	48.859
	2-Family	.883	.549	4.129	5.561
	Multi-Family	.667	.305	7.487	8.459
	Total	9.391	5.736	48.280	63.407
Alternative 2	Mobile Home	.076	.053	.368	.497
	1-Family	7.588	4.718	35.467	47.773
	2-Family	.987	.614	4.613	6.214
	Multi-Family	.716	.327	8.037	9.080
	Total	9.367	5.712	48.485	63.564
Alternative 3	Mobile Home	.078	.055	.379	.512
	1-Family	7.645	4.753	35.731	48.129
	2-Family	.923	.574	4.316	5.813
	Multi-Family	.684	.313	7.685	8.682
	Total	9.330	5.695	48.111	63.136
Alternative 4	Mobile Home	.082	.058	.398	.538
	1-Family	7.909	4.917	36.964	49.790
	2-Family	.908	.564	4.243	5.715
	Multi-Family	.684	.313	7.674	8.671
	Total	9.583	5.852	49.279	64.714
Alternative 5	Mobile Home	.084	.059	.411	.554
	1-Family	7.954	4.945	37.177	50.076
	2-Family	.818	.508	3.822	5.148
	Multi-Family	.638	.292	7.166	8.096
	Total	9.494	5.804	48.576	63.874
Alternative 6	Mobile Home	.079	.056	.386	.521
	1-Family	7.710	4.794	36.038	48.542
	2-Family	.899	.559	4.200	5.658
	Multi-Family	.673	.308	7.561	8.542
	Total	9.361	5.717	48.185	63.263

TABLE VI-9

YEAR 2000 CARBON MONOXIDE EMISSIONS FROM RESIDENTIAL SOURCES
(In Millions of Pounds)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	.09	.02	.08	.19
	1-Family	8.46	1.72	7.25	17.43
	2-Family	.96	.20	.83	1.99
	Multi-Family	.73	.11	1.50	2.34
	Total	10.24	2.05	9.66	21.95
Alternative 2	Mobile Home	.08	.02	.07	.17
	1-Family	8.27	1.68	7.09	17.04
	2-Family	1.08	.22	.92	2.22
	Multi-Family	.78	.12	1.61	2.51
	Total	10.21	2.04	9.69	21.94
Alternative 3	Mobile Home	.09	.02	.08	.19
	1-Family	8.33	1.70	7.15	17.18
	2-Family	1.01	.20	.86	2.07
	Multi-Family	.75	.11	1.52	2.38
	Total	10.18	2.03	9.61	21.82
Alternative 4	Mobile Home	.09	.02	.08	.19
	1-Family	8.62	1.76	7.39	17.77
	2-Family	.99	.20	.85	2.04
	Multi-Family	.75	.11	1.53	2.39
	Total	10.45	2.09	9.85	22.39
Alternative 5	Mobile Home	.09	.02	.08	.19
	1-Family	8.67	1.77	7.44	17.88
	2-Family	.89	.18	.76	1.83
	Multi-Family	.70	.10	1.43	2.23
	Total	10.35	2.07	9.71	22.13
Alternative 6	Mobile Home	.09	.02	.08	.19
	1-Family	8.40	1.71	7.21	17.32
	2-Family	.98	.20	.84	2.02
	Multi-Family	.73	.11	1.51	2.35
	Total	10.20	2.04	9.64	21.88

TABLE VI-10

YEAR 2000 TOTAL SUSPENDED PARTICULATE EMISSIONS FROM RESIDENTIAL SOURCES

(In Millions of Pounds)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	1.20	.04	.04	1.28
	1-Family	116.42	3.45	3.63	123.50
	2-Family	13.25	.39	.41	14.05
	Multi-Family	10.01	.21	.75	10.97
	Total	140.88	4.09	4.83	149.80
Alternative 2	Mobile Home	1.14	.04	.04	1.22
	1-Family	113.82	3.37	3.55	120.74
	2-Family	14.81	.44	.46	15.71
	Multi-Family	10.74	.23	.80	11.77
	Total	140.51	4.08	4.85	149.44
Alternative 3	Mobile Home	1.17	.04	.04	1.25
	1-Family	114.68	3.39	3.57	121.64
	2-Family	13.85	.41	.43	14.69
	Multi-Family	10.26	.22	.77	11.25
	Total	139.96	4.06	4.81	148.83
Alternative 4	Mobile Home	1.23	.04	.04	1.31
	1-Family	118.64	3.51	3.70	125.85
	2-Family	13.62	.40	.42	14.44
	Multi-Family	10.26	.22	.77	11.25
	Total	143.75	4.17	4.93	152.85
Alternative 5	Mobile Home	1.26	.04	.04	1.34
	1-Family	119.31	3.53	3.72	126.56
	2-Family	12.27	.36	.38	13.01
	Multi-Family	9.57	.21	.72	10.50
	Total	142.41	4.14	4.86	151.41
Alternative 6	Mobile Home	1.19	.04	.04	1.27
	1-Family	115.65	3.42	3.60	122.67
	2-Family	13.49	.40	.42	14.31
	Multi-Family	10.10	.22	.76	11.08
	Total	140.43	4.08	4.82	149.33

TABLE VI-11

YEAR 2000 SULFUR OXIDE EMISSIONS FROM RESIDENTIAL SOURCES
(In Millions of Pounds)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	6.28	.18	0	6.46
	1-Family	609.24	14.91	.22	624.37
	2-Family	69.32	1.70	.02	71.04
	Multi-Family	52.36	.94	.04	53.34
	Total	737.20	17.73	.28	755.21
Alternative 2	Mobile Home	5.97	.16	0	6.13
	1-Family	595.66	14.58	.21	610.45
	2-Family	77.48	1.90	.03	79.41
	Multi-Family	56.21	1.01	.05	57.27
	Total	735.32	17.65	.29	753.26
Alternative 3	Mobile Home	6.12	.17	0	6.29
	1-Family	600.13	14.69	.21	615.03
	2-Family	72.46	1.77	.03	74.26
	Multi-Family	53.69	.97	.05	54.71
	Total	732.40	17.60	.29	750.29
Alternative 4	Mobile Home	6.44	.18	0	6.62
	1-Family	620.86	15.19	.22	636.27
	2-Family	71.28	1.74	.03	73.05
	Multi-Family	53.69	.97	.05	54.71
	Total	752.27	18.08	.30	770.65
Alternative 5	Mobile Home	6.59	.18	0	6.77
	1-Family	624.39	15.28	.22	639.89
	2-Family	64.21	1.57	.02	65.80
	Multi-Family	50.08	.90	.04	51.02
	Total	745.27	17.93	.28	763.48
Alternative 6	Mobile Home	6.20	.17	0	6.37
	1-Family	605.24	14.81	.22	620.27
	2-Family	70.57	1.73	.03	72.33
	Multi-Family	52.83	.95	.05	53.83
	Total	734.84	17.66	.30	752.80

TABLE VI-12

YEAR 2000 NITROGEN OXIDE EMISSIONS FROM RESIDENTIAL SOURCES
(In Millions of Pounds)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	4.61	.05	.39	5.05
	1-Family	447.81	4.14	36.27	488.22
	2-Family	50.95	.47	4.13	55.55
	Multi-Family	38.49	.26	7.49	46.24
	Total	541.86	4.92	48.28	595.06
Alternative 2	Mobile Home	4.39	.05	.37	4.81
	1-Family	437.83	4.04	35.47	477.34
	2-Family	56.95	.53	4.61	62.09
	Multi-Family	41.31	.28	8.04	49.63
	Total	540.48	4.90	48.49	593.87
Alternative 3	Mobile Home	4.50	.05	.38	4.93
	1-Family	441.12	4.07	35.73	480.92
	2-Family	53.26	.50	4.32	58.08
	Multi-Family	39.47	.27	7.69	47.43
	Total	538.35	4.89	48.12	591.36
Alternative 4	Mobile Home	4.73	.05	.40	5.18
	1-Family	456.35	4.21	36.96	497.52
	2-Family	52.39	.48	4.24	57.11
	Multi-Family	39.47	.27	7.67	47.41
	Total	552.94	5.01	49.27	607.22
Alternative 5	Mobile Home	4.85	.05	.41	5.21
	1-Family	458.95	4.24	37.18	500.37
	2-Family	47.20	.44	3.82	51.46
	Multi-Family	36.81	.25	7.17	44.23
	Total	547.81	4.98	48.58	601.27
Alternative 6	Mobile Home	4.56	.05	.39	5.00
	1-Family	444.87	4.11	36.04	485.02
	2-Family	51.87	.48	4.20	56.55
	Multi-Family	38.83	.26	7.56	46.65
	Total	540.13	4.90	48.19	593.22

TABLE VI-13

YEAR 2000 HYDROCARBON EMISSIONS FROM RESIDENTIAL SOURCES
(In Millions of Pounds)
(For Comparison Purposes Only)

		Electricity	Fuel Oil	Natural Gas	Total
Alternative 1	Mobile Home	.03	.01	.03	.07
	1-Family	2.73	1.03	2.90	6.66
	2-Family	.31	.12	.33	.76
	Multi-Family	.23	.07	.60	.90
	Total	3.30	1.23	3.86	8.39
Alternative 2	Mobile Home	.03	.01	.03	.07
	1-Family	2.67	1.01	2.84	6.52
	2-Family	.35	.13	.37	.85
	Multi-Family	.25	.07	.64	.96
	Total	3.30	1.22	3.88	8.40
Alternative 3	Mobile Home	.03	.01	.03	.07
	1-Family	2.69	1.01	2.86	6.56
	2-Family	.32	.12	.35	.79
	Multi-Family	.24	.07	.61	.92
	Total	3.28	1.21	3.85	8.34
Alternative 4	Mobile Home	.03	.01	.03	.07
	1-Family	2.78	1.05	2.96	6.79
	2-Family	.32	.12	.34	.78
	Multi-Family	.24	.07	.61	.92
	Total	3.37	1.25	3.94	8.56
Alternative 5	Mobile Home	.03	.01	.03	.07
	1-Family	2.80	1.06	2.97	6.83
	2-Family	.29	.11	.31	.71
	Multi-Family	.22	.06	.57	.85
	Total	3.34	1.24	3.88	8.46
Alternative 6	Mobile Home	.03	.01	.03	.07
	1-Family	2.71	1.03	2.88	6.62
	2-Family	.32	.12	.34	.78
	Multi-Family	.24	.07	.60	.91
	Total	3.30	1.23	3.85	8.38

In conclusion, it is clear that the land use policies of each of the alternatives have very little effect on residential energy consumption or environmental pollution resulting from this energy usage. Although there are differences among the alternatives, the differences are small enough to be insignificant. From this, it is possible to conclude that land use regulations are not likely to be effective in reducing residential energy consumption.

WATER QUALITY

Analysis

Land use patterns and the density of development are two factors which affect the quantity and pollution loading of storm water run-off. Since these factors vary under each SAF alternative, it is very likely that the level of water pollution resulting from storm water run-off will differ among the six alternatives. To determine how great a difference might exist among the alternatives, the land use patterns resulting from each were analyzed using the SEM-STORM water quality model.[1]

To perform this analysis, it was necessary to divide the region into 27 units based on the boundaries of watersheds and parts of river basins. These units are shown in Figure VI-3. As can be seen in the figure, the larger river basins such as the Clinton Basin were divided into as many as five analysis units.

The method used to estimate the nonpoint pollution loads, or the water pollution carried by storm water run-off, for a given alternative involved three steps. First, the land use pattern in the year 2000 was determined for each watershed analysis unit. Second, the land use information was combined with regional soils data to prepare a watershed profile in the form of a computerized data file for each of the 27 analysis units. Finally, these data files were analyzed in conjunction with a rainfall history compiled within Southeast Michigan, using the SEM-STORM water quality model. The results of the model provided estimates of the annual nonpoint pollution loads flowing into the lakes and streams in the region during storms.

It should be noted that this procedure does not estimate the loadings of some forms of nonpoint pollution such as those produced by septic tank disposal systems, or certain kinds of agricultural operations such as feedlots. A more detailed presentation of the method used in the analysis appears in Consequence of a "No Action Alternative" on Urban Nonpoint Pollution in Southeast Michigan,[2] a background paper on the impacts of projected urban development in the Clinton, Rouge, and Huron Rivers.

The Results

Table VI-14 presents the annual nonpoint loadings of suspended solids

FIGURE VI-3

BASINS USED FOR WATER QUALITY ANALYSIS

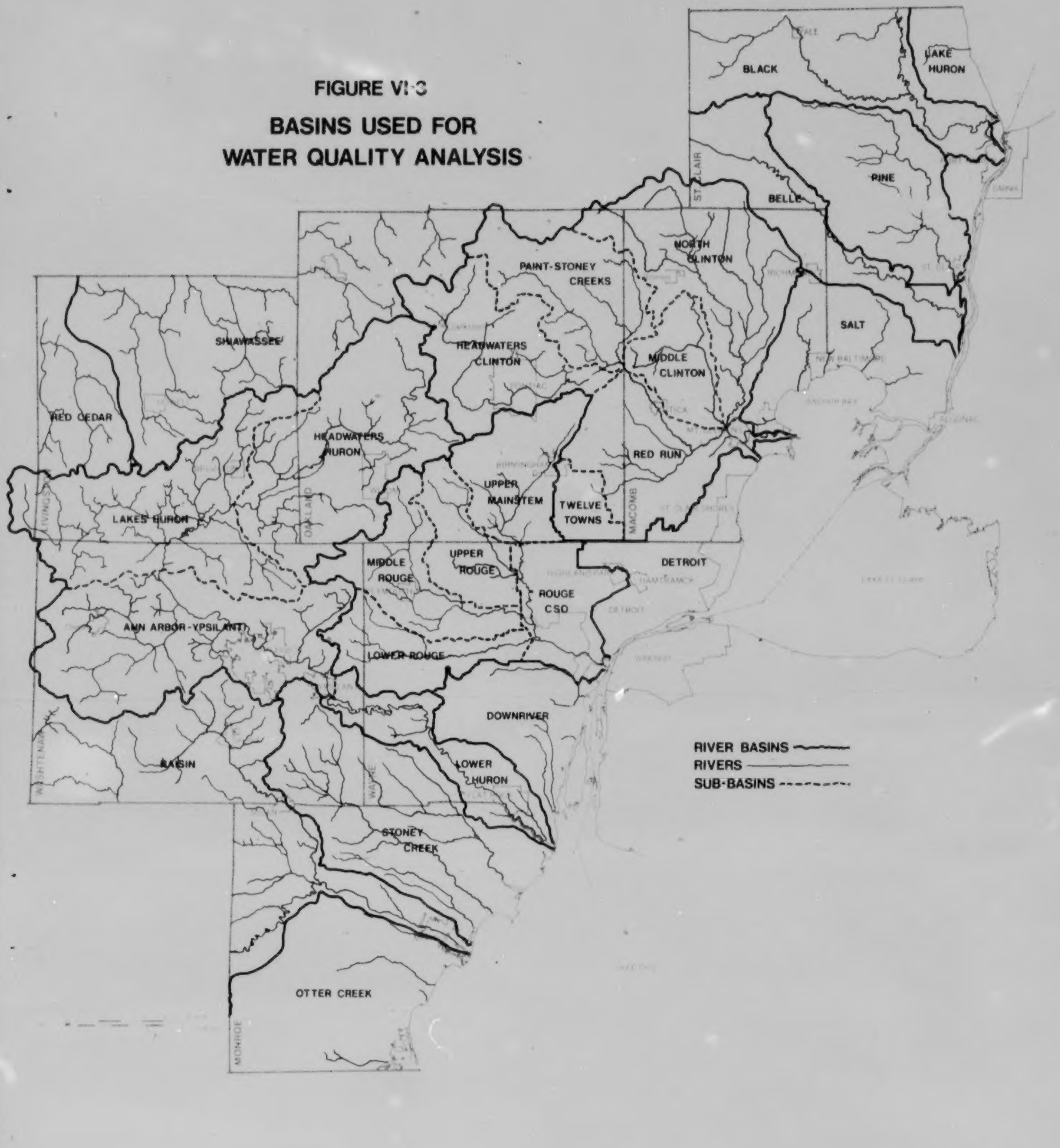
BLACK
LAKE HURON
PINE
BELLE
ST CLAIR
NORTH CLINTON
PAINT-STONEY CREEKS
SALT
SHIAWASSEE
HEADWATERS CLINTON
MIDDLE CLINTON
RED CEDAR
HEADWATERS HURON
RED RUN
UPPER MAINSTEM
TWELVE TOWNS
LIVINGSTON
OAKLAND
MACOMB
LAKES HURON
MIDDLE ROUGE
UPPER ROUGE
DETROIT
ROUGE CSO
ANN ARBOR-YPSILANTI
LOWER ROUGE
DOWNRIVER
WASHTENAW
RAISIN
WAYNE
LOWER HURON
STONEY CREEK
OTTER CREEK
MONROE
RIVER BASINS
RIVERS
SUB-BASINS

TABLE VI-14

YEAR 2000 NON-POINT SUSPENDED SOLIDS BY BASIN (In Tons)

Basin	Source	1975 Base	Alternative 1	2	3	4	5	6
Detroit	Urban	6250.7	5860.7	5566.9	5751.4	5714.4	5449.5	5751.4
	Non-Urban	23.3	25.5	28.6	29.5	34.2	31.2	26.0
Rouge - CSO	Urban	5005.3	4850.3	4869.3	4871.0	4641.9	4638.0	4889.9
	Non-Urban	20.4	23.2	19.8	22.2	35.3	26.8	22.4
Upper Rouge	Urban	1636.1	2738.2	2347.7	2663.8	1995.5	2725.4	2592.2
	Non-Urban	977.5	713.4	856.6	789.0	894.6	707.0	737.1
Middle Rouge	Urban	1008.8	1685.2	1473.7	1733.5	1358.0	1734.1	1787.0
	Non-Urban	99.5	66.8	87.8	84.7	82.9	62.9	60.6
Lower Rouge	Urban	509.2	904.0	856.1	839.4	688.5	824.8	892.6
	Non-Urban	1372.3	1185.5	1198.9	1211.3	1266.5	1218.9	1170.3
Upper Mainstream Rouge	Urban	2383.3	3454.3	2967.8	3569.7	2671.8	3474.6	3512.1
	Non-Urban	68.5	41.1	51.9	61.3	58.5	43.6	40.4
Downriver	Urban	2798.2	3759.0	3303.9	3503.1	3042.4	3423.6	3479.8
	Non-Urban	653.2	511.6	567.4	536.9	611.8	549.0	537.2
Lower Huron	Urban	352.9	1003.7	612.4	1017.6	499.7	835.4	915.4
	Non-Urban	1428.6	1002.5	1222.9	1012.5	1293.3	1090.9	1043.3
Huron Headwaters	Urban	769.3	2541.2	1509.9	2561.9	963.8	3871.6	3124.9
	Non-Urban	1408.7	1129.4	1401.7	1472.8	1381.3	876.6	1102.0
Ann Arbor-Ypsilanti	Urban	823.2	1365.5	933.7	1179.6	1143.8	1743.0	1409.1
	Non-Urban	5598.6	5076.4	5542.0	5317.1	5303.2	4736.9	5039.8
Huron Lakes	Urban	108.6	440.7	169.1	402.7	140.6	859.1	643.1
	Non-Urban	2634.7	2366.6	2596.6	2539.4	2566.4	2186.1	2244.7
Twelve Towns Drain	Urban	1931.1	1988.1	1943.6	1945.7	1888.9	1917.4	1955.1
	Non-Urban	6.1	4.3	6.0	4.6	6.9	5.1	4.6
Red Run	Urban	3515.4	5224.0	4549.9	5004.0	3866.5	5046.1	5075.7
	Non-Urban	149.2	64.8	129.6	134.2	126.7	66.8	74.8
Clinton Headwaters	Urban	2191.2	4185.5	3344.8	3449.7	2454.3	4206.5	4044.5
	Non-Urban	603.1	351.2	553.0	675.9	546.9	337.4	394.4
Paint Creek	Urban	367.0	1311.7	574.0	1051.5	404.4	2643.3	948.8
	Non-Urban	183815	1425.2	1842.0	1895.6	1748.2	1018.4	1555.8
Middle Clinton	Urban	317.7	765.4	505.2	783.9	381.2	715.3	816.9
	Non-Urban	434.0	361.4	407.8	351.8	413.6	364.2	349.4
North Clinton	Urban	294.8	454.1	401.9	405.9	408.9	466.8	455.6
	Non-Urban	2712.0	2548.2	2685.9	2607.5	2568.8	2519.8	2571.0
Stoney Creek	Urban	200.0	1111.4	353.2	1280.1	366.7	1345.3	1089.0
	Non-Urban	5846.6	4817.3	5554.0	4680.1	5562.1	4709.3	4849.7
River Raisin	Urban	124.8	590.3	182.2	558.6	322.0	1026.7	588.0
	Non-Urban	8020.4	7205.2	7902.8	7237.1	7652.5	6815.9	7215.4

continued

TABLE VI-14(continued)

Basin	Source	1975 Base	Alternative 1	2	3	4	5	6
Otter Creek	Urban	211.9	1542.3	329.1	1660.2	324.9	1675.4	1192.8
	Non-Urban	4429.9	3297.3	4225.9	3230.3	4232.6	3378.5	3539.2
Salt	Urban	502.2	939.9	712.8	949.5	754.0	1032.3	1029.4
	Non-Urban	1795.4	1608.3	1744.1	1600.2	1614.8	1546.7	1589.1
Belle	Urban	78.4	300.2	109.7	191.2	185.2	404.0	255.8
	Non-Urban	3889.9	3559.2	3860.5	3689.9	3685.7	3459.8	3616.5
Pine	Urban	208.5	748.1	290.4	353.6	339.7	892.6	628.2
	Non-Urban	3873.0	3373.2	3830.2	3689.7	3678.1	3259.1	3475.8
Black	Urban	271.7	494.3	391.2	434.9	684.5	573.4	494.2
	Non-Urban	3371.2	3176.4	3381.8	3221.7	3010.6	3114.4	3165.7
Lake Huron	Urban	22.5	52.6	26.8	52.3	58.7	69.9	79.8
	Non-Urban	853.0	816.1	849.4	830.0	800.2	797.1	791.2
Shiawassee	Urban	183.4	992.8	322.7	980.6	290.6	4191.9	1016.0
	Non-Urban	5833.2	5217.5	5916.4	6001.7	5724.4	3909.9	5228.5
Red Cedar	Urban	19.7	79.8	23.2	46.2	37.7	428.5	107.0
	Non-Urban	2111.1	1996.7	2110.6	2126.6	2062.0	1724.0	1957.6
REGION	Urban	32085.9	49383.3	38671.2	47241.6	35628.6	56214.5	48774.3
	Non-Urban	60051.9	51964.3	58511.2	55053.6	56962.1	48556.3	52402.5

for each analysis unit and the region as a whole by alternative. Alternative 4 produces the least amount of the alternatives, effectively maintaining the 1975 loadings of just over 92,000 tons. Alternative 5 generates the greatest loadings with a total of close to 105,000 tons. The remaining alternatives generate roughly the same loadings, ranging from slightly over 97,000 tons under Alternative 2 to more than 102,000 tons under Alternative 3.

The reasons that there is not a greater difference between Alternatives 1, 3, and 6 is due to the nature of development in the region. Under all of these alternatives vacant and agricultural land is converted to low density residential land uses. Both of these land uses generate about the same amount of suspended solids.[3] Thus, although land is converted to more urban uses under each alternative, there is still not much change in total loadings.

Although the amount of suspended solids does not vary much among the alternatives, the proportion that is generated from urbanized areas does. This would not be significant if storm water runoff in rural areas was the same as that found in urban areas, but this is not the case. Urban run-off typically contains higher loadings of phosphorus and lead than run-off in rural areas. Thus, it is desirable to minimize the amount of storm run-off in urban areas.

Table VI-15 shows the annual tons non-point suspended solids originating from urban areas by each analysis unit. The percentage change in the total from 1975 to 2000 is also included in the table. Since Alternatives 2 and 4 develop the least amounts of agricultural and vacant land, they generate the least urban run-off. In general Alternative 4 produces the least urban run-off in the more urbanized watersheds, while Alternative 2 produces the least in the watersheds that contain comparatively little urban development. Alternative 3 ranks third in reducing urban run-off, although some basins, notably the more urban basins, do better under Alternatives 1 and 5.

With respect to individual basins, the results show little differences among alternatives for some, and quite a bit for others. Generally there is little difference in the Detroit, Rouge CSO and Twelve Towns basins in which the older urban areas are located. This is because these basins are almost fully developed, and remain so under all of the alternatives.

Moreover, in a large number of basins, the difference between the lowest and the highest nonpoint loading in any basin is not great. This difference is not considered great because the actual pollutant loadings in an area will be determined by the site planning associated with the development. The basins (see Figure VI-3) in this category are:

Upper Rouge,
Upper Mainstream Rouge,
Middle Rouge,
Lower Rouge,
Downriver,
Lower Huron,

TABLE VI-15

YEAR 2000 URBAN NON-POINT SUSPENDED SOLIDS LOADINGS BY BASIN (In Tons)

(Figures in Parentheses are Per Cent Change from 1975)

Basin	1975 Base	Alternative					
		1	2	3	4	5	6
Detroit	6250.7	5860.7 (-6.24)	5566.9 (-10.94)	5751.4 (-7.99)	5714.4 (-8.58)	5449.5 (-12.82)	5751.4 (-7.99)
Rouge	5005.3	4850.3 (-3.10)	4869.3 (-2.72)	4871.0 (-2.68)	4641.9 (-7.26)	4638.0 (-7.34)	4889.9 (-2.31)
Upper Rouge	1636.1	2738.2 (67.36)	2347.7 (43.49)	2663.8 (62.81)	1995.5 (21.97)	2725.4 (66.58)	2592.2 (58.44)
Middle Rouge	1008.8	1685.2 (67.05)	1473.7 (46.08)	1733.5 (71.84)	1358.0 (34.62)	1734.1 (71.90)	1787.0 (77.14)
Lower Rouge	509.2	904.0 (77.53)	856.1 (68.13)	839.4 (64.85)	688.5 (35.21)	824.8 (61.98)	892.6 (75.29)
Upper Mainstream Rouge	2383.3	3454.3 (44.94)	2967.8 (24.52)	3569.7 (49.78)	2671.8 (12.11)	3474.6 (45.79)	3512.1 (47.36)
Downriver	2798.2	3759.0 (34.34)	3303.9 (18.07)	3503.1 (25.19)	3042.4 (8.73)	3423.6 (22.35)	3479.8 (24.36)
Lower Huron	352.9	1003.7 (184.41)	612.4 (73.53)	1017.6 (188.35)	499.7 (41.60)	835.4 (136.72)	915.4 (159.39)
Huron Headwaters	769.3	2541.2 (230.33)	1509.9 (96.27)	2561.9 (233.02)	963.8 (25.28)	3871.6 (403.26)	3124.9 (306.20)
Ann Arbor-Ypsilanti	823.2	1365.5 (65.88)	933.7 (13.42)	1179.6 (43.29)	1143.8 (38.95)	1743.0 (111.73)	1409.1 (71.17)
Huron Lakes	108.6	440.7 (305.80)	169.1 (55.71)	402.7 (270.81)	140.6 (29.47)	859.1 (691.07)	643.1 (492.17)
Twelve Towns Drain	1931.1	1988.1 (2.95)	1943.6 (.65)	1945.7 (.76)	1888.9 (-2.19)	1917.4 (-.71)	1955.1 (1.24)
Red Run	3515.4	5224.0 (48.60)	4549.9 (29.43)	5004.0 (42.35)	3866.5 (9.99)	5046.1 (43.54)	5075.7 (44.38)
Clinton Headwaters	2191.2	4185.5 (91.01)	3344.8 (52.65)	3449.7 (57.43)	2454.3 (12.01)	4206.5 (91.97)	4044.5 (84.58)
Paint Creek	367.0	1311.7 (257.41)	574.0 (56.40)	1051.5 (186.51)	404.4 (10.19)	2643.3 (620.25)	948.8 (158.53)
Middle Clinton	317.7	765.4 (140.92)	505.2 (59.02)	783.9 (146.74)	381.2 (19.99)	715.3 (125.15)	816.9 (157.13)
North Clinton	294.8	454.1 (54.04)	401.9 (36.33)	405.9 (37.69)	408.9 (38.70)	466.8 (58.34)	455.6 (54.55)
Stoney Creek	200.0	1111.4 (455.70)	353.2 (76.60)	1280.1 (540.05)	366.7 (83.35)	1345.3 (572.65)	1089.0 (444.50)
River Raisin	124.8	690.3 (373.00)	182.2 (45.99)	558.6 (347.60)	322.0 (158.01)	1026.7 (722.68)	588.0 (371.15)
Otter Creek	211.9	1542.3 (627.84)	329.1 (55.31)	1660.2 (683.48)	324.9 (53.33)	1675.4 (690.66)	1192.8 (462.91)

TABLE VI-15(continued)

Basin	1975 Base	Alternative					
		1	2	3	4	5	6
Salt	502.2	939.9 (87.16)	712.8 (41.94)	949.5 (89.07)	754.0 (50.14)	1032.3 (105.56)	1029.4 (104.98)
Belle	78.4	300.2 (282.91)	109.7 (39.92)	191.2 (143.88)	185.2 (136.22)	404.0 (415.31)	255.8 (226.28)
Pine	208.5	748.1 (258.80)	290.4 (39.28)	353.6 (69.59)	339.7 (62.93)	892.6 (328.11)	628.2 (201.29)
Black	271.7	494.3 (81.93)	391.2 (43.98)	434.9 (60.07)	684.5 (151.93)	573.4 (111.04)	494.2 (81.89)
Lake Huron	22.5	52.6 (133.78)	26.8 (19.11)	52.3 (132.44)	58.7 (160.89)	69.9 (210.67)	79.8 (254.67)
Shiawassee	183.4	992.8 (441.33)	322.7 (75.95)	980.6 (434.68)	290.6 (58.45)	4191.9 (2185.66)	1016.0 (453.98)
Red Cedar	19.7	79.8 (305.08)	23.2 (17.77)	46.2 (134.52)	37.7 (91.37)	428.5 (2075.13)	107.0 (443.15)
REGION	32085.9	49383.3 (53.91)	38671.2 (20.52)	47241.6 (47.23)	35628.6 (11.04)	56214.5 (75.20)	48774.3 (52.01)

Salt, and
Black.

In all but the last two of these basins Alternative 4 produces the least loading followed by Alternative 2. For the Salt and Black basins, this result is reversed. In the remaining basins, however, there is a considerable range of estimated pollutant loadings between the alternatives. The areas where such impacts are greatest is in basins which have hydrologically "closed" lake watersheds; in these systems the impacts of storm water pollutant loadings tend to accumulate over time. Thus basins with lakes whose watersheds are developed by 2000 may experience water quality problems. These areas, as shown in Figure VI-3, include:

Huron Headwaters,
Huron Lakes,
Clinton,
Shiawassee, and
Red Cedar

In these basins, it is thought that regardless of the kind of water quality protection that may be designed into commercial and residential developments, there is a substantial difference in alternative forecasts. In these areas Alternative 3 is generally the best after the high density Alternatives 2 and 4.

In conclusion, the alternatives that encourage high density residential development generate the least pollutant loads in storm water run-off. Alternative 4 which spreads new development more evenly throughout the region has the least effect on water quality overall. However, this is achieved by increasing the urban nonpoint loadings in areas that are currently relatively free of nonpoint pollutants.

Alternative 2 concentrates urban run-off in areas where nonpoint pollution problems already exist. If treatment of storm water run-off become practical, it would be desirable if such pollution were concentrated so that it could be treated more economically. Thus, in the long run, Alternative 2 may be the most attractive alternative.

TRANSPORTATION

Introduction

To assist in the comparative analysis of travel, energy consumption and air quality between the six development alternatives, the TRIMS model was used.[4] TRIMS, as a sketch-planning tool, provides an overall quantitative comparison of alternatives, but does not address detailed design parameters. Accordingly, the numbers presented in this section should be viewed as measures of the relative differences between alternatives and the 1970 base year and not as absolute predictions of future travel, energy consumption or air quality. The analysis conducted was effectively an analysis of impacts to the existing transportation infrastructure.

Travel Forecasts

Vehicle Miles Traveled (VMT)*

The lowest VMT is found in Alternatives 1 and 6. VMT increases from a low of 97.1 x 10^6 to 105.5 x 10^6 over the 1970 base of 58.3 x 10^6. In other words, VMT for Alternatives 1 and 6 is 166 per cent of comparable 1970 data. Alternative 4 on the other hand is 181 per cent of 1970 data. The difference between high and low VMT, therefore, is a 14 per cent change over the 1970 base (see Table VI-22).

Accessibility

Under no conditions, can a household reach 55 per cent of the jobs within 45 minutes via transit systems that rely on buses. Using an automobile, however, Alternative 2 offers the most accessibility to jobs (Table VI-16). This is again reflected in the per cent of jobs within 45 minutes (Table VI-17). Even for Alternative 2, the per cent of the region's total jobs located within 45 minutes of a household is less than found in the 1970 base case.

Trip Length

Table VI-18 presents the average trip length by mode* for each alternative. Trip lengths are greater than those found in 1970 for all alternatives, with greater increases for transit than for automobile travel. Alternative 6 has the lowest highway and transit trip lengths, although the advantage over Alternatives 1 and 3 is slight.

Mode Split

Transit's regional market share of trip making decreases for all alternatives from 8.2 per cent experienced in 1970 as shown in Table VI-19. The new transit market share for the year 2000 ranges from a minimum of 4.9 per cent (Alternative 4) to a maximum of 5.9 per cent (Alternatives 1, 2, 3 and 6.)

In absolute terms, the number of transit passengers increases a maximum of ten per cent over the 1970 base; automobile travel increases, at a minimum, 54 per cent.

Transit's share of the Detroit CBD-bound market likewise decreases from 17.6 per cent to a maximum of 14.6 per cent under Alternatives 1 and 6. In absolute terms, transit passengers increase a maximum of 10,644. Table VI-20 shows the split between auto and transit trips in 1970 and for each alternative by the year 2000.

TABLE VI-16

YEAR 2000 ACCESSIBILITY TO JOBS*

Network	1970 Base	Alternative 1	2	3	4	5	6
Highway	1190538	1409633	1452830	1409469	1133657	1308945	1409332
Transit	0	0	0	0	0	0	0
Total Households	1422635	2098739	2099651	2098813	2098877	2098584	2099105
Total Jobs	1730151	2262592	2262544	2262621	2262578	2262573	2262565

TABLE VI-17

YEAR 2000 PER CENT OF JOBS WITHIN 45 MINUTES BY NETWORK TYPE

Network	1970 Base	Alternative 1	2	3	4	5	6
Highway	74	59	61	59	49	56	59
Transit	16	9	9	9	7	8	9

TABLE VI-18

YEAR 2000 AVERAGE WORK TRIP LENGTH IN MINUTES BY MODE

Mode	1970 Base	Alternative 1	2	3	4	5	6
Auto Person Trips	24.0	26.1	26.3	26.2	30.1	27.0	26.1
Transit Passenger Trips	45.2	53.0	53.6	52.9	60.4	55.5	52.8

*NOTE: Accessibility as defined here means: Number of households that can reach 55% of jobs within 45 minutes by network type and alternative.

TABLE VI-19

YEAR 2000 HOME-BASED WORK TRIP MODE SPLITS

(Per cent of Total Trips in Year in Parenthesis)

Mode	1970 Base	Alternative					
		1	2	3	4	5	6
Auto Person Trips	2378649 (91.8)	3672455 (94.1)	3726216 (94.1)	3722392 (94.1)	3711065 (95.1)	3717147 (94.6)	3677189 (94.1)
Transit Passenger Trips	211852 (8.2)	231281 (5.9)	234039 (5.9)	233743 (5.9)	189372 (4.9)	214208 (5.4)	230772 (5.9)
Total Person Trips	2590501 (100.0)	3903736 (100.0)	3960255 (100.0)	3956135 (100.0)	3900437 (100.0)	3931355 (100.0)	3907961 (100.0)

TABLE VI-20

YEAR 2000 MODE SPLIT FOR DETROIT CBD HOME-BASED WORK TRIPS

(Per Cent of Total Trips in Year in Parenthesis)

Mode	1970 Base	Alternative 1	2	3	4	5	6
Auto Person Trips	158647 (82.4)	261877 (85.4)	266080 (85.8)	264693 (85.5)	249679 (88.0)	260793 (86.5)	260838 (85.4)
Transit Passenger Trips	33972 (17.6)	44616 (14.6)	43890 (14.2)	44891 (14.5)	34108 (12.0)	40701 (13.5)	44454 (14.6)
Total Person Trips	192619 (100.0)	306493 (100.0)	309970 (100.0)	309584 (100.0)	283787 (100.0)	301494 (100.0)	305292 (100.0)

Vehicle Trip Table Orientation

Table VI-21 presents the split in total vehicle trips between the suburbs, the City of Detroit[5] and the core area.[6] Between 1970 and 2000 there is less orientation of suburban trips to the City of Detroit and more emphasis on City of Detroit trips to the suburbs. Increases in travel to the core is a direct result of increases in Central Business District employment. Travel demand on a county level is assumed to vary in the same proportion as the growth in households and jobs. Staff will analyze sub-regional impacts in the near future.

Mobile Source Energy Consumption

An average fleet fuel economy standard of 27.5 miles per gallon[7] is currently in force for 1979 model cars through Section 502(a)(3) of the Motor Vehicle Information and Cost Savings Act. Thus, while Vehicle Miles Traveled (VMT) increases significantly between 1970 and 2000, increases in fuel economy more then offset the increases in travel, resulting in lower energy consumption. With the exception of Alternative 4, all alternatives appear to consume less energy than that consumed in the base year, 1970. Alternative 1 and 6 appear to be the least energy consumption. Table VI-22 shows the calculations, assumptions and results of this analysis.

Mobile Source Emissions

Similar to the discussion of energy consumption, air quality improves for all alternatives between 1970 and 2000, with Alternatives 1 and 6 showing the most improvement. The reduction in emissions between 1970 and 2000 is primarily due to Federally mandated vehicle emission standards originally specified in the 1970 Clean Air Act and later revised.

The reduction of emissions between 1970 and 2000 more than compensate for increase in vehicle miles traveled. Table VI-23 contains the results of this analysis. Assumptions for this analysis were that the fleet for the 1970 base and the forecast years was composed of 84.5 per cent autos, 9.7 per cent light trucks, 3.5 per cent heavy trucks (gas), and 2.3 per cent heavy trucks (diesel).

Summary

In summary, Alternatives 1, 3 and 6 are identical and relatively superior to other alternatives in many ways from a transportation perspective. These alternatives exhibit the lowest vehicle miles traveled, emissions, and energy consumption, as well as shortest trip lengths. Accessibility to jobs is high (2nd place), regional mode split for work trips by transit is relatively high at 5.9 per cent with a moderate increase in the absolute number of transit passenger forecasted. Similarly, CBD transit mode split for these alternatives is high at 14.6 per cent with a moderate increase in the absolute number of transit passengers forecasted. Conversely, Alternatives 4 and 5 have the least transportation efficient

TABLE IV-21

YEAR 2000 TOTAL VEHICLE TRIP TABLE

(Per Cent of Total Trips in Year in Parenthesis)

Trips	1970 Base	Alternative					
		1	2	3	4	5	6
SUBURBAN TRIPS TO:							
City of Detroit Core Area[1]	187340 (3.6)	307623 (3.2)	320103 (3.3)	310591 (3.2)	325344 (3.2)	320974 (3.2)	303600 (3.2)
City of Detroit Excluding[2] Core	735958 (14.1)	823232 (8.6)	850139 (8.8)	839501 (8.8)	786836 (7.9)	794716 (8.0)	824296 (8.7)
Suburbs	4286957 (82.3)	8387056 (88.1)	8482244 (87.9)	8436275 (88.0)	8973026 (89.0)	8781693 (88.7)	8338020 (88.1)
TOTAL	5210255 (100.0)	9517911 (100.0)	9652486 (100.0)	9586367 (100.0)	10085206 (100.0)	9897383 (100.0)	9465916 (100.0)
CITY OF DETROIT TRIPS TO:							
City of Detroit Core Area	287499 (12.6)	309623 (15.2)	311990 (15.1)	319294 (15.2)	251206 (15.6)	286672 (15.9)	318877 (15.1)
City of Detroit Excluding Core	1305212 (57.3)	1024626 (50.4)	850139 (41.3)	1067493 (50.7)	796413 (49.3)	888478 (49.1)	1068666 (50.7)
Suburbs	686892 (30.1)	700500 (34.4)	896908 (43.6)	720228 (34.2)	567201 (35.1)	632741 (35.0)	721970 (34.2)
TOTAL	2279553 (100.0)	2034749 (100.0)	2059037 (100.0)	2107015 (100.0)	1614820 (100.0)	1807891 (100.0)	2109513 (100.0)

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[1] Includes CBD, Medical Center, Cultural Center, New Center and adjacent areas.

[2] Includes Highland Park, Hamtramck, and the Grosse Pointes.

NB: Figures based on existing 1975 highway network with freeways under construction added; and on 1975 existing all-bus transit system.

TABLE VI-22

YEAR 2000 REGIONWIDE MOBILE SOURCE ENERGY CONSUMPTION
PER AVERAGE WEEKDAY
(Passenger Vehicles Only)

	1970 Base	Alternative 1	2	3	4	5	6
Vehicle Miles Traveled ($x10^3$)	58305	97133	99348	99283	105525	100701	97193
Average Vehicle Economy[1] (miles) per gallon)	15.4	27.5	27.5	27.5	27.5	27.5	27.5
Average Vehicle Consumption (gal/mile)	.0649	.0364	.0364	.0364	.0364	.0364	.0364
Gallons of Gasoline Consumed (10^3)	3784	3535	3616	3613	3841	3665	3537
BTUs Consumed[2] (10^6)	483000	451000	460000	460000	490000	470000	450000

[1] The year 2000 passenger vehicle fleet will theoretically achieve the mandated 27.5 mpg fuel economy standard through the attrition of vehicles with pre-1985 techology. Vehicles not achieving the 1985 standard of 27.5 mpg will not account for an significant percentage of the year 2000 fleet, probably less than one per cent.

[2] One gallon of gasoline is equal to 127,650 BTUs.

TABLE VI-23

YEAR 2000 REGIONWIDE MOBILE SOURCE EMISSIONS

	1970 Base	Alternative 1	2	3	4	5	6
Vehicle Miles Traveled ($x10^3$)	66225	111359	113420	113726	119956	115300	111380
Carbon Monoxide (kg)	2062490	461335	470100	470319	486565	374515	461653
Nitrite Oxide (kg)	466492	229379	233596	234435	248735	238168	229423
Hydrocarbons (kg)	416317	95223	97013	97126	101219	98044	95263

NOTE: VMT includes load-links.

mode split. As stated in the introduction of this paper, however, it should be emphasized that this paper reviews the relative differences of alternatives with no certainty that the transportation needs of the "best" alternative can be satisfied.

FOOTNOTES: CHAPTER VI

[1] This water quality model is a planning level model designed for comparing land use impacts on water quality. The model is documented in Shulsinski, R.P., A.J. Knepp, and C.R. Bristol, Computer Program Documentation for the Continuous Storm Runoff Model SEM-STORM.

[2] Collins, P.G., Consequences of a "No Action Alternative" on Urban Nonpoint Pollution in Southeast Michigan, Southeast Michigan Council of Governments, Detroit, Michigan, March, 1978.

[3] Davis, L.C., et al., Model Calibration and Validation: QUAL-II, SEM-STORM, and RUNQUAL, prepared by Water Resources Engineers, Inc., Walnut Creek, California, for Southeast Michigan Council of Governments, Detroit, Michigan, December, 1977.

[4] TRIMS (Transportation Integrated Modeling System) was developed by staff of the Metropolitan Washington Council of Governments. Application for the Southeast Michigan Region is documented in the report: Calibration and Evaluation of the Use of the TRIMS Package for Southeast Michigan by Smith and Richardson, SEMCOG, July, 1977.

[5] Includes Highland Park, Hamtramck and the Grosse Pointes.

[6] Detroit CBD, Medical Center, New Center and adjacent areas.

[7] Final Rules on Standards Promulgated by NHTSA, FR 20, Vol. 42, No. 126, June 30, 1977.

[8] Vehicle miles traveled as used in this table includes travel on local roads.

APPENDIX A

DEVELOPMENT OF COMMUNITY GROUPS

APPENDIX A

DEVELOPMENT OF COMMUNITY GROUPS

The Small Area Forecast model operates at the analysis zone level. This level of detail (there are 1446 of them in the region) is too great for purposes of policy analysis. Accordingly, several higher levels of aggregation are employed in this document. Zones are summed to Minor Civil Division in Appendix B. In the body of the report, Minor Civil Divisions are summed to the county level.

The purpose of county aggregations is obvious. Counties are a generally accepted and widely used large scale unit for examining change in the region. However, county level aggregations may in some cases mask changes at the sub-county level. For example, under a given alternative a county might have a net change from the years 1970 to 2000 of zero households. This net change could be composed of a loss of households in large cities, no change in suburban areas, and a gain of households in previously rural areas.

To account for such a situation, a grouping of communities into seven categories has been developed. Communities within each group have some similar characteristics based on 1970 data. Since the policies expressed in a single alternative are consistent throughout the region, similar results tend to be seen in communities which have similar characteristics, regardless of their location in the region. Thus, the groupings will show changes to communities with relatively similar circumstances, regardless of their county -- changes which can be masked by county-level summaries.

Table A-1 summarizes the specific criteria used to define each group. In this grouping, cities and villages are grouped separately from townships. Within the cities and villages, they are grouped according to population and percent "built-up", which is a measure of how fully developed the community was in 1970.

Group 1 consists of populous cities with relatively little remaining vacant land which could be developed.

Group 2 consists of populous cities which still have a significant amount of vacant land that could be developed.

Group 3 consists of less populous cities and villages with relatively little remaining vacant land which could be developed.

TABLE A-1

COMMUNITY GROUP CLASSIFICATION

Community Group	Government	1970 Population	1970 Percent Built-Up	Sewered Holding Capacity 1970
Group 1	Cities and Villages	15,000+	81-100	-
Group 2	Cities and Villages	15,000+	0-80	-
Group 3	Cities and Villages	0-15,000	81-100	-
Group 4	Cities and Villages	0-15,000	0-80	-
Group 5	Townships	10,000+	-	-
Group 6	Townships	0-10,000	-	0-450
Group 7	Townships	0-10,000	-	450+

TABLE A-2

COMMUNITY GROUPS BY COUNTY

County	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Total
Detroit	1	-	-	-	-	-	-	1
Out-Wayne	14	7	5	7	4	0	5	42
Oakland	7	5	6	20	9	10	2	59
Macomb	5	1	2	8	3	3	5	27
Washtenaw	1	1	1	4	2	10	8	27
Monroe	0	1	1	7	3	10	2	24
St. Clair	1	0	0	8	0	15	8	32
Livingston	0	0	1	3	0	13	3	20
TOTAL	29	15	16	57	21	61	33	232

Group 4 consists of less populous cities and villages which still have a significant amount of vacant land that could be developed.

Within the township groups, communities are grouped by population and sewered holding capacity in 1970, which is a measure of how much investment in sewers existed at the beginning of the forecast process.

Group 5 consists of townships which are populous, regardless of other characteristics.

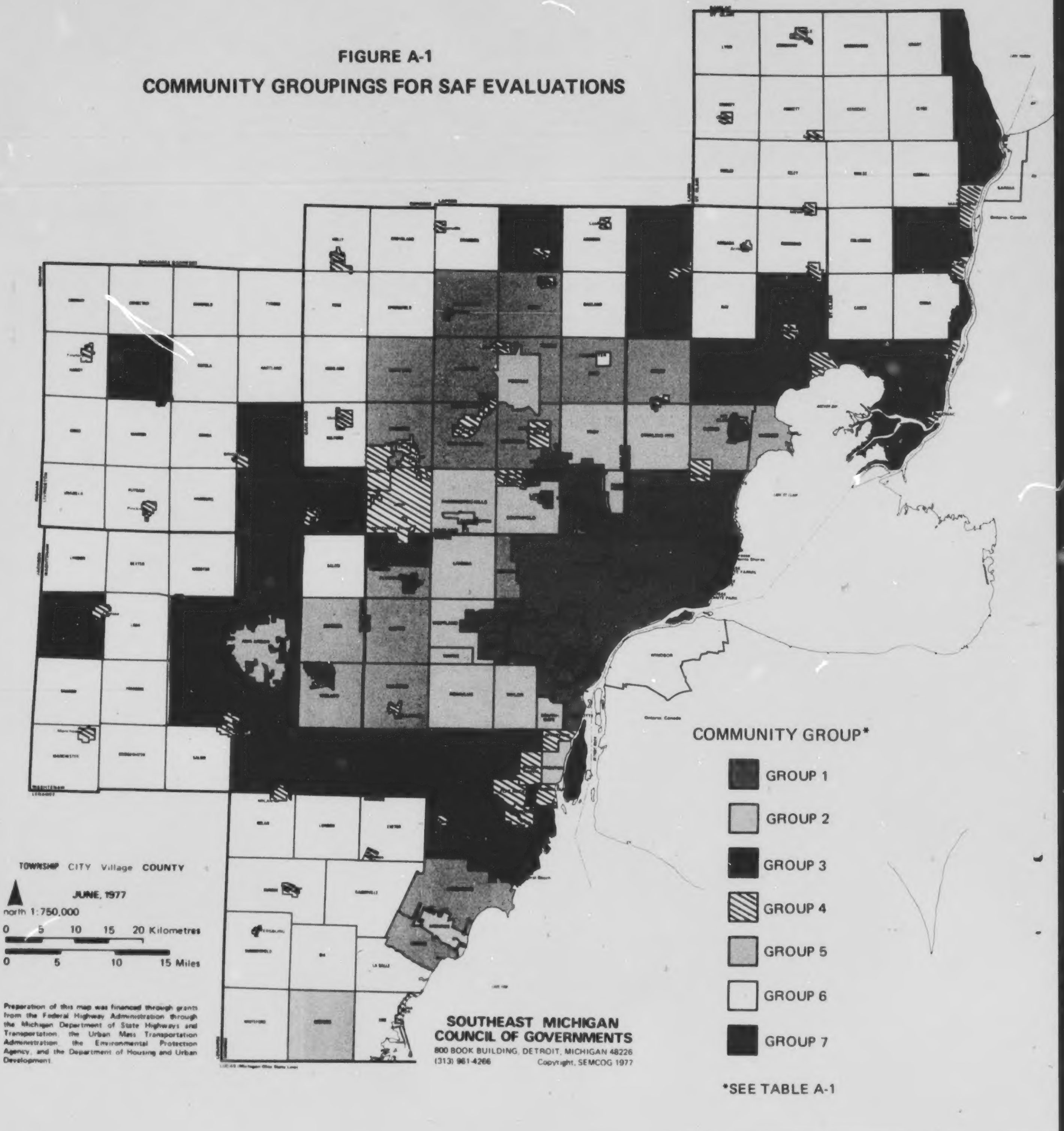
Group 6 consists of less populous townships without significant investments in sewer in 1970.

Group 7 consists of less populous townships which had significant sewer investments in 1970.

A distribution of the number of communities in each group by county is presented in Table A-2. Table A-3 lists all communities in the region and gives the characteristics on which the grouping was based. Finally, Figure A-1 is a map, showing how the groups distribute over the entire region.

The group to which a community is assigned in no way affects the results for the community. It is simply a display device applied to the results after they are produced, to assist in understanding the results at a regional scale.

FIGURE A-1
COMMUNITY GROUPINGS FOR SAF EVALUATIONS


COMMUNITY GROUP*
GROUP 1
GROUP 2
GROUP 3
GROUP 4
GROUP 5
GROUP 6
GROUP 7
*SEE TABLE A-1
TOWNSHIP CITY Village COUNTY
JUNE, 1977
north 1:750,000
0 5 10 15 20 Kilometres
0 5 10 15 Miles
WINDSOR
Ontario, Canada
LA SALLE

Preparation of this map was financed through grants from the Federal Highway Administration through the Michigan Department of State Highways and Transportation, the Urban Mass Transportation Administration, the Environmental Protection Agency, and the Department of Housing and Urban Development.

SOUTHEAST MICHIGAN COUNCIL OF GOVERNMENTS
800 BOOK BUILDING, DETROIT, MICHIGAN 48226
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TABLE A-3

LIST OF MINOR CIVIL DIVISIONS BY COMMUNITY GROUP

GROUP 1

Community	1970 Population	Percent Developed 1970
Allen Park	40690	83
Berkley	22618	100
Birmingham	26181	87
Clawson	17631	95
Dearborn	103988	81
Dearborn Heights	80083	95
Detroit	1510395	92
East Detroit	45881	99
Ecorse	17523	97
Ferndale	30763	99
Garden City	41901	90
Grosse Pointe Park	15535	100
Grosse Pointe Woods	21621	97
Hamtramck	27257	98
Harper Woods	20342	98
Hazel Park	23680	100
Highland Park	35444	98
Inkster	38548	87
Lincoln Park	52966	93
Mt. Clemens	20338	87
Oak Park	36665	98
Port Huron	38799	86
River Rouge	15919	93
Roseville	60436	81
Royal Oak	85564	97
St. Clair Shores	87941	92
Warren	178624	82
Wyandotte	40969	96
Ypsilanti	26864	84

continued

TABLE A-3 (continued)

GROUP 2

Community	1970 Population	Percent Developed 1970
Ann Arbor	102603	74
Farmington Hills	50047	30
Livonia	109757	62
Madison Heights	38392	79
Monroe	20407	54
Pontiac	84789	65
Romulus	22507	38
Southfield	68823	73
Southgate	33904	64
Sterling Heights	61128	38
Taylor	69997	54
Trenton	24037	73
Troy	38892	41
Wayne	21061	72
Westland	86556	61

GROUP 3

Beverly Hills	13599	84
Centerline	10392	92
Clarkston	1048	98
Dexter	1686	84
Grosse Pointe	6599	100
Grosse Pointe Farms	11690	99
Grosse Pointe Shores (part)	148	90
Grosse Pointe Shores (part)	2886	91
Howell	5224	81
Huntington Woods	8243	100
Lathrup Village	4346	89
Melvindale	13784	89
Petersburg	1422	84
Pleasant Ridge	3989	100
Plymouth	11786	85
Rochester	7019	94

continued

TABLE A-3 (continued)

GROUP 4

Community	1970 Population	Percent Developed 1970
Algonac	3684	65
Armada	1423	48
Belleville	2421	48
Bingham Farms	703	30
Bloomfield Hills	3672	49
Brighton	2634	61
Capac	1060	44
Carleton	1555	39
Chelsea	3939	57
Dundee	2700	59
Emmett	248	13
Estral Beach	486	34
Farmington	12059	76
Flat Rock	5680	22
Fowlerville	2141	45
Franklin	3157	67
Fraser	11868	56
Gibraltar	3322	22
Holly	4355	42
Keego Harbor	3092	75
Lake Angelus	586	58
Lake Orion	2892	47
Leonard	337	20
Luna Pier	1397	40
Manchester	1645	37
Marine City	4567	70
Marysville	5611	55
Maybee	564	23
Memphis (part)	867	43
Memphis (part)	309	47
Milan (part)	3775	83
Milan (part)	822	33
Milford	4664	43
New Baltimore	3868	28
New Haven	1871	23
Northville (part)	3033	79
Northville (part)	2263	55
Novi	9827	13
Orchard Lake	1427	70
Ortonville	963	79
Oxford	2536	57
Pinckney	739	19
Richmond	3059	42

continued

TABLE A-3 (continued)

GROUP 4 (continued)

Community	1970 Population	Percent Developed 1970
Riverview	11342	54
Rockwood	3125	31
Romeo	4016	68
Saline	4811	54
South Lyon	2675	44
South Rockwood	1420	40
St. Clair	4770	62
Sylvan Lake	2075	36
Utica	3504	74
Walled Lake	3880	44
Wixom	2004	20
Wolverine Lake	3914	52
Woodhaven	3258	28
Yale	1447	64

GROUP 5

Community	1970 Population	Sewered Holding Capacity 1970
Avon Township	24361	4895
Bedford Township	20839	14239
Bloomfield Township	42554	3233
Canton Township	10987	29546
Clinton Township	48888	22994
Commerce Township	14788	0
Frenchtown Township	14637	3753
Harrison Township	18669	8064
Independence Township	16192	1181
Monroe Township	12883	7269
Orion Township	14202	673
Plymouth Township	17486	5407
Pontiac Township	12359	2176
Redford Township	71951	743
Shelby Township	29300	10117
Superior Township	10235	11899
Van Buren Township	13083	16181
Waterford Township	58898	8458
West Bloomfield	28489	13813
White Lake Township	14293	0
Ypsilanti Township	29859	18073

continued

TABLE A-3 (continued)

GROUP 6

Community	1970 Population	Sewered Holding Capacity 1970
Addison Township	2471	0
Armada Township	1604	0
Berlin Township SC	1361	0
Brandon Township	3850	0
Bridgewater Township	1068	0
Brockway Township	1076	0
Casco Township	1926	139
China Township	1851	0
Clyde Township	4745	0
Cohoctah Township	1546	0
Columbus Township	1930	200
Conway Township	1121	0
Deerfield Township	1269	0
Dexter Township	2317	0
Dundee Township	2209	194
Emmett Township	803	0
Erie Township	4517	0
Exeter Township	2406	0
Freedom Township	1354	0
Genoa Township	4623	0
Grant Township	845	0
Greenwood Township	996	0
Groveland Tonwship	2571	0
Hamburg Township	5481	0
Handy Township	1488	0
Hartland Township	2822	0
Highland Township	8372	0
Holly Township	3042	0
Ida Township	3377	0
Iosco Township	738	0
Kenockee Township	697	0
Kimball Township	5965	0
LaSalle Township	4155	0
Lima Township	1194	38
London Township	2522	0
Lyndon Township	1211	0
Lynn Township	920	0
Manchester Township	1097	0
Marion Township	2430	0
Milan Township	1830	80
Milford Township	2591	0
Mussey Township	2228	0
Oakland Township	4794	0
Oceola Township	2964	216
Putnam Township	2616	0

continued

TABLE A-3 (continued)

GROUP 6 (continued)

Community	1970 Population	Sewered/Holding Capacity 1970
Raisinville Township	4009	270
Ray Township	2685	0
Richmond Township	1682	0
Riley Township	1237	0
Rose Township	2506	0
Royal Oak Township	6294	0
Salem Township	3004	0
Saline Township	1280	85
Sharon Township	808	0
Springfield Township	4386	0
Summerfield Township	2420	264
Tyrone Township	3187	0
Unadilla Township	2111	0
Wales Township	886	0
Webster Township	2943	312
Whiteford Township	4056	0

GROUP 7

Ann Arbor Township	1730	4040
Ash Township	4260	1766
Augusta Township	4378	2770
Berlin Township MN	3605	2342
Brighton Township	5882	603
Brownstown Township	7078	18226
Bruce Township	2191	493
Burtchville Township	1807	660
Chesterfield Township	9340	17764
Clay Township	6438	4695
Cottrellville Township	2014	1443
East China Township	2103	2894
Fort Gratiot Township	6184	5234
Green Oak Township	7597	1172
Grosse Ile Township	7799	4675
Howell Township	2357	792
Huron Township	8028	9201
Ira Township	3844	4104
Lenox Township	2869	1551
Lodi Township	1926	1655
Lyon Township	4498	2043
Macomb Township	5846	15758
Northfield Township	3975	2834
Northville Township	9443	7495

continued

TABLE A-3 (continued)

GROUP 7 (continued)

Community	1970 Population	Sewered/Holding Capacity 1970
Oxford Township	5954	607
Pittsfield Township	8820	14271
Port Huron Township	5560	3139
Scio Township	3675	12658
St. Clair Township	3592	1695
Sumpter Township	8092	468
Sylvan Township	1651	1207
Washington Township	5671	8057
York Township	5680	809

APPENDIX B

TABLES OF POPULATION AND HOUSEHOLDS BY MINOR CIVIL DIVISION

Note: 1970 values may differ somewhat from other published values. Numbers presented here were taken from Bureau of Census Tapes. Subsequent adjustments made by the Bureau in their published reports were not made to their tapes. Also, these local Units of Government values were aggregated from SEMCOG analysis zones. In some cases, there are boundary incompatibilities between zones and Minor Civil Divisions.

In addition, the forecast values are questionable for some Minor Civil Divisions due to inaccuracies in the policy inputs and base data errors. Two examples of these problems are evident in the forecast values for Superior Township in Washtenaw County and Sterling Heights in Macomb County, where the model produces unbelievably low forecast households and population. When the policy bodies complete their selection of a SAF alternative, the model will be rerun with appropriate corrections. In the meantime, the MCD values presented in these tables should be used only for comparison purposes between the alternatives.

TABLE B-1

YEAR 2000 POPULATION BY MINOR CIVIL DIVISION

Minor Civil Division	1970 Base	Alternative					
		1	2	3	4	5	6
Detroit	1510395	1054174	1049570	1112218	716061	910934	1104902
Allen Park	40690	30653	29704	30509	25736	29780	30354
Belleville	2421	4263	4210	4329	3888	4455	4303
Brownstown Twp.	7078	59002	45784	54964	31337	49351	52331
Canton Twp.	10987	63364	78527	55894	55673	55007	56475
Dearborn	103988	88752	82149	86644	68596	77785	84305
Dearborn Heights	80083	54499	53378	54443	41672	52463	47529
Ecorse	17523	12975	12553	12903	11029	11408	11233
Flat Rock	5680	17524	13411	13206	11628	11994	12908
Garden City	41901	28918	28525	28641	23695	27706	28479
Gibraltar	3322	6492	4888	4832	2922	4740	4408
Grosse Ile Twp.	7799	10925	16059	12200	10870	10696	11761
Grosse Pointe	6599	5390	5274	5435	4642	5307	5401
Grosse Pointe Farms	11690	8892	8733	8983	8249	9516	9237
Grosse Pointe Park	15535	9400	9324	9700	8056	8643	9792
Grosse Pointe Shores (pt)	2886	2423	2666	2446	2466	2388	2429
Grosse Pointe Woods	21621	15261	15065	15261	12380	14440	15178
Hamtramck	27257	22906	22833	24409	14973	18627	25648
Harper Woods	20342	15466	16215	15604	13454	14158	15027
Highland Park	35444	25825	26081	27704	17705	21585	27872
Huron Twp.	8028	18370	20983	26001	19339	21492	19343
Inkster	38548	33640	30634	31902	23822	30295	31714
Lincoln Park	52966	40152	39766	40408	35467	39487	39625
Livonia	109757	109366	108069	111121	81971	108734	106628
Melvindale	13784	11671	11047	11628	9242	11414	12422
Northville	3033	3059	2851	3162	2023	2401	3155
Northville Twp.	9443	22995	37292	25303	20395	24492	24042
Plymouth	11786	11814	11687	11752	8588	10631	11655
Plymouth Twp.	17486	23931	28052	22538	20278	21761	23576
Redford Twp.	71951	49324	47649	50689	42965	48792	49561
River Rouge	15919	12347	10409	12438	10793	12149	12339
Riverview	11342	11662	14437	12377	10328	11993	11965
Rockwood	3125	4627	3898	3890	2457	3744	4050
Romulus	22507	35740	38356	35141	28950	31633	35350
Southgate	33904	32563	30738	30926	25396	29834	30606
Sumpter Twp.	8092	19904	33257	21291	15943	18598	23289
Taylor	69997	85732	79162	79031	57929	75796	78342
Trenton	24037	21707	21149	21509	17547	21035	21412
Van Buren Twp.	13083	54320	54364	56640	39712	46699	53832
Wayne	21061	24335	20284	20868	16468	19209	20682
Westland	86556	99062	97166	94095	70287	93713	94366
Woodhaven	3258	11354	11052	10387	7877	9640	10329
Wyandotte	40969	31148	29273	31074	23843	28235	30854
Addison Twp.	2471	4887	4682	4822	23315	7061	5313
Avon Twp.	24361	49428	63165	36619	53561	48439	48835
Berkley	22618	12748	12881	14081	8326	10320	13838
Beverly Hills	13599	9807	11630	9745	8063	10661	9823
Bingham Farms	703	583	998	649	401	445	724
Birmingham	26181	19292	23088	20166	15691	17666	19676
Bloomfield Hills	3672	5175	11669	4074	6413	3894	5591
Bloomfield Twp.	42554	41165	49697	37113	35710	37252	39787
Brandon Twp.	3850	8857	6167	6158	23996	15095	15686
Clarkston	1048	803	786	801	791	1023	1028
Clawson	17631	11275	11037	11247	8342	10701	11156
Commerce Twp.	14788	24971	26763	17494	29689	31777	28959
Farmington	12059	11174	10240	10765	6405	9982	10446
Farmington Hills	50047	55060	81407	55379	55167	54408	59475
Ferndale	30763	20583	20782	21941	13690	16088	21863
Franklin	3157	2972	3750	3220	2512	3358	3282
Groveland Twp.	2571	9331	4500	6337	8960	12359	4910
Hazel Park	23680	15301	15361	16202	10337	12298	16113
Highland Twp.	8372	16518	17737	16891	29701	21186	27255
Holly	4355	5289	4224	4871	4298	8821	3235
Holly Twp.	3042	9683	4269	5414	27888	10393	4276
Huntington Woods	8243	5542	5413	5583	5037	5449	5552

Continued

TABLE B-1(continued)

Minor Civil Division	1970 Base	Alternative 1	2	3	4	5	6
Independence Twp.	16192	35402	32302	33488	32210	38441	33898
Keego Harbor	3092	2354	2241	2571	1607	1841	2522
Lake Angelus	586	597	645	653	997	1067	430
Lake Orion	2892	3364	5357	3069	3201	4119	3287
Lathrup Village	4346	3926	4316	3951	3106	4461	3927
Leonard	337	509	432	400	1617	413	347
Lyon Twp.	4498	18766	12720	16693	15208	25637	16768
Madison Heights	38392	32689	31489	30901	22094	30327	31205
Milford	4664	5231	7484	5053	5608	5210	5226
Milford Twp.	2591	5098	5532	6778	12830	9376	5214
Northville	2263	2819	2784	2554	1923	2730	2786
Novi	9827	35399	45536	31038	44604	36252	29149
Oakland Twp.	4794	15435	13026	14352	9760	28864	10657
Oak Park	36665	27749	25146	25923	19591	27332	25530
Orchard Lake	1427	1714	1834	1923	3098	2691	1182
Orion Twp.	14202	25604	29334	16128	38291	34560	25537
Ortonville	963	694	943	704	1325	774	695
Oxford	2536	2508	6515	2075	2273	2320	2321
Oxford Twp.	5954	13573	14325	16828	17917	27499	14786
Pleasant Ridge	3989	2832	2775	2852	2641	2788	2837
Pontiac	84789	64233	66980	67124	47137	58858	69190
Pontiac Twp.	12359	23265	27820	20653	19083	23925	22683
Rochester	7019	7381	7119	7455	6906	7072	7152
Rose Twp.	2506	7215	6128	9534	12478	13609	8367
Royal Oak	85564	58532	58700	61747	42577	50719	60932
Royal Oak Twp.	6294	6374	6319	6579	5739	6450	6545
Southfield	68823	76725	82981	75383	64150	82349	77227
South Lyon	2675	5106	5164	4637	5717	5071	5082
Springfield Twp.	4386	19464	18355	35325	12480	33720	18510
Sylvan Lake	2075	1710	1766	1738	1286	1277	1715
Troy	38892	69050	77557	58498	58846	61472	64774
Walled Lake	3880	3330	4478	3141	6805	4568	3307
Waterford Twp.	58898	61599	66924	54266	57532	68710	62660
West Bloomfield Twp.	28489	40494	72907	36167	36974	40318	44597
White Lake Twp.	14293	28055	32347	28008	29352	32029	37948
Wixom	2004	13833	14552	11196	13452	11190	5248
Wolverine Lake	3914	3378	3548	3343	3506	3652	3467
Armada	1423	1672	1883	1690	2029	1705	1637
Armada Twp.	1604	2906	3045	3642	22724	3325	1629
Bruce Twp.	2191	9576	6403	5426	15504	4483	6440
Centerline	10392	7713	7688	7811	6961	7824	7763
Chesterfield Twp.	9340	45241	61692	49843	31483	45151	46030
Clinton Twp.	48888	82727	86718	84925	55342	77980	81005
East Detroit	45881	28221	26609	29955	20256	24115	29685
Fraser	11868	13565	14353	13437	11047	13117	13332
Grosse Pointe Shores (pt)	148	200	202	200	192	200	200
Harrison Twp.	18669	28922	30532	30446	21740	28469	29313
Lenox Twp.	2869	7668	9567	9124	15072	8538	10384
Macomb Twp.	5846	31618	18411	23092	23492	20776	20327
Memphis (pt.)	867	1889	2946	2119	1246	2268	2109
Mt. Clemens	20338	16972	15335	19380	15961	18661	17974
New Baltimore	3868	8482	8748	8079	9655	7593	8122
New Haven	1871	3595	4147	4440	2701	3969	4075
Ray Twp.	2685	5516	4958	9889	12032	9216	7274
Richmond	3059	5208	7999	5208	3977	5087	5174
Richmond Twp.	1682	4074	3487	4571	22313	5019	3795
Romeo	4016	3695	2814	2911	2676	2838	2888
Roseville	60436	46894	42888	47156	35807	42498	46971
Shelby Twp.	29300	64805	37533	63720	51249	59239	61644
Sterling Heights	61128	78911	96855	83360	58093	77830	79449
St. Clair Shores	87941	61129	62212	62492	49538	57669	61993
Utica	3504	4495	5841	4510	4574	4417	3588
Warren	178624	137041	137603	134784	105390	131915	132477
Washginton Twp.	5671	27112	17992	33643	17378	30446	24562
Ann Arbor	102603	101516	107998	117066	81545	105097	110772
Ann Arbor Twp.	1730	13317	8578	15028	10695	9141	13232
August Twp.	4379	19736	10579	17966	9819	21466	20813
Bridgewater Twp.	1068	2800	1265	1995	30941	3848	3113

Continued

TABLE B-1(continued)

Minor Civil Division	1970 Base	Alternative 1	2	3	4	5	6
Chelsea	3939	4932	5571	11450	3305	5631	5878
Dexter	1686	1412	1531	1465	1314	1506	1441
Dexter Twp.	2317	4894	6014	3765	13363	12699	4497
Freedom Twp.	1354	4071	1536	2732	57441	4913	4158
Lima Twp.	1194	3820	1632	3582	17349	6538	4078
Lodi Twp.	1926	6512	3907	5953	10682	5539	7789
Lyndon Twp.	1211	3867	1284	2760	5408	6815	3498
Manchester	1645	2818	6089	4079	2988	3168	2603
Manchester Twp.	1097	2973	1872	2497	32232	3733	3644
Milan (part)	3775	2980	2951	3023	2771	2944	3000
Northfield Twp.	3975	8544	8990	13011	21362	13761	11621
Pittsfield Twp.	8820	27209	20024	31336	16297	27793	29527
Salem Twp.	3004	7619	5515	6362	7223	7438	6311
Saline	4811	6970	7657	9089	6136	6969	6890
Saline Twp.	1280	2505	3028	1499	12373	4907	3901
Scio Twp.	3675	38681	13395	28133	21298	37672	43679
Sharon Twp.	808	4745	1591	4042	36793	7081	3527
Superior Twp.	10235	7609	6206	7672	7479	8301	8164
Sylvan Twp.	1651	4058	4809	4916	12057	5190	7080
Webster Twp.	2943	3677	4040	2361	16422	5208	3714
York Twp.	5680	9094	5707	11128	22578	14384	13346
Ypsilanti	26864	25499	27758	28031	22358	27737	26064
Ypsilanti Twp.	29859	89092	107699	107833	61163	92335	77764
Ash Twp.	4250	16575	10936	15595	22547	16668	11707
Bedford Twp.	20839	51754	66601	52325	62102	43273	50963
Berlin Twp.	3605	14453	15059	17473	30924	15707	13210
Carlton	1555	2331	1701	2372	1804	2373	2362
Dundee	2700	5195	5320	5221	2907	5141	5214
Dundee Twp.	2209	10460	9176	4209	18354	12987	6772
Erie Twp.	4517	17794	15818	15704	22525	15802	9924
Estral Beach	486	376	343	350	331	342	464
Exeter Twp.	2406	6181	3063	7527	7784	6338	6489
Frenchtown Twp.	14637	35882	34409	36733	46150	30589	30295
Ida Twp.	3377	22117	3550	11687	10107	12085	21706
LaSalle Twp.	4155	12444	17329	8442	21146	16011	10146
London Twp.	2522	9140	2886	11990	15370	11915	6749
Luna Pier	1397	1038	1019	1042	1894	2199	1356
Maybee	564	3212	480	2285	1701	3276	1452
Milan (part)	822	579	795	706	544	570	591
Milan Twp.	1830	6057	2144	7018	12947	8403	6633
Monroe	20407	20917	21863	21132	22881	23971	21127
Monroe Twp.	12888	15645	20245	16263	18290	14055	15218
Petersburg	1422	1010	1339	1020	974	992	1011
Raisinville Twp.	4009	15721	6832	12185	8863	11306	10994
South Rockwood	1420	3278	3448	3915	2959	3497	3254
Summerfield Twp.	2420	9758	7232	12074	14987	14986	11143
Whiteford Twp.	4056	20188	4590	13939	14114	12521	7392
Algonac	3684	5035	5134	5341	3438	4995	5175
Berlin Twp.	1361	6245	2178	2774	36186	6739	4494
Brockway Twp.	1076	3631	4138	3625	72670	4652	4200
Burtchville Twp.	1807	7462	7594	4731	18218	8297	5137
Capac	1060	3563	3710	3244	1778	3185	2578
Casco Twp.	1926	5717	3912	3683	40180	6178	5725
China Twp.	1851	7247	2194	4630	19879	9168	3953
Clay Twp.	6438	13899	14331	19189	44010	21372	19595
Clyde Twp.	4745	6389	7220	4694	16203	6936	5549
Columbus Twp.	1930	7301	5015	4152	24624	7662	6139
Cottrellville Twp.	2014	8690	4584	7015	19767	12072	7984
East China Twp.	2103	7196	8248	11234	8673	10227	8423
Emmett	248	683	279	590	2619	360	284
Emmett Twp.	803	5791	1997	1739	23699	7259	4965
Fort Gratiot Twp.	6184	12752	17215	20431	24067	15463	12431
Grant Twp.	845	2901	1295	1542	20054	3186	3269
Greenwood Twp.	996	1895	1726	1658	30654	2522	2166
Ira Twp.	3844	9234	14402	11867	16460	10769	11178
Kenockee Twp.	697	8077	2240	2248	49318	6594	5054
Kimball Twp.	5965	19198	42748	18731	32550	21050	21992
Lynn Twp.	920	2446	1304	1745	57215	2555	2914
Marine City	4567	5481	5674	5711	3892	5431	4973

Continued

TABLE B-1(continued)

Minor Civil Division	1970 Base	Alternative					
		1	2	3	4	5	6
Marysville	5611	8039	13277	8113	8085	7799	8524
Memphis (part)	309	860	1322	872	1218	1499	900
Mussey Twp.	2228	602	644	674	3764	2816	692
Port Huron	38799	35804	34394	37489	27658	35470	37017
Port Huron Twp.	5560	16155	29644	17386	26471	17083	16125
Riley Twp.	1237	6704	1739	5167	29559	6805	4223
St. Clair	4770	6699	8669	7716	4692	7099	6974
St. Clair Twp.	3592	10014	7299	10820	15940	11501	8978
Wales Twp.	886	9728	5195	2673	32161	11030	7529
Yale	1447	2317	3240	2336	1844	2363	2313
Brighton	2634	7670	8552	7689	5025	7503	7619
Brighton Twp.	5882	16242	12855	20743	17223	27529	25074
Cohoctah Twp.	1546	4657	2158	2321	13293	5586	5693
Conway Twp.	1121	2728	1268	1421	29443	3399	3656
Deerfield Twp.	1269	7366	2748	4553	19012	38634	9851
Fowlerville	2141	2177	2864	2527	2408	2378	2016
Genoa Twp.	4623	16467	13056	17910	10052	25234	21965
Green Oak Twp.	7597	18233	11268	15108	23740	25950	28051
Hamburg Twp.	5481	17435	13043	14983	16330	23304	17566
Handy Twp.	1488	4729	2154	3382	8804	5449	6181
Hartland Twp.	2822	8088	9955	12860	11208	24510	9957
Howell	5224	5558	6891	6227	6475	5988	5437
Howell Twp.	2357	8248	5186	11293	11699	13853	10909
Iosco Twp.	738	16384	1024	1950	15197	9172	2218
Marion Twp.	2430	9919	3727	5571	12836	27572	13133
Oceola Twp.	2964	7371	3412	5836	27231	28255	9177
Pinckney	739	2150	3049	1978	3111	2479	2032
Putnam Twp.	2616	5839	5447	7087	13040	8424	13647
Tyrone Twp.	3187	9920	4537	12231	10864	18620	11860
Unadilla Twp.	2111	6802	3580	4223	9015	8059	8524

TABLE B-2

YEAR 2000 HOUSEHOLDS BY MINOR CIVIL DIVISION

Minor Civil Division	1970 Base	Alternative					
		1	2	3	4	5	6
Detroit	497682	449204	452754	469185	328017	392658	468043
Allen Park	11494	12952	12822	12814	11604	12777	12822
Belleville	856	1772	1784	1785	1725	1903	1785
Brownstown Twp.	2064	22777	18713	22317	12517	20412	21270
Canton Twp.	3262	24937	29481	22594	20587	22640	23167
Dearborn	34634	38069	35835	36929	31555	33720	35959
Dearborn Heights	22467	22846	22566	22710	18653	21287	19086
Ecorse	5323	5512	5452	5446	5029	4429	4318
Flat Rock	1546	7212	5744	5587	5088	5173	5487
Garden City	10481	12082	12171	11870	10590	11741	11868
Gibraltar	939	2758	2088	2004	1282	2010	1826
Grosse Ile Twp.	2166	4628	7057	5099	4827	4568	4940
Grosse Pointe	2288	2311	2311	2311	2138	2311	2311
Grosse Pointe Farms	3728	3787	3802	3800	3771	3800	3659
Grosse Pointe Park	4821	4008	4064	4105	3682	3743	4168
Grosse Pointe Shores (pt)	897	1011	1133	1014	1117	1013	1013
Grosse Pointe Woods	6314	6571	6634	6524	5711	6315	6524
Hamtramck	10315	9898	10096	10468	6933	8112	10989
Harper Woods	6497	6557	6034	6568	6100	5739	5974
Highland Park	12411	11120	11475	11834	8160	9431	11973
Huron Twp.	2096	6556	6835	9497	6943	7968	7126
Inkster	10443	14006	13001	13181	10554	12792	13176
Lincoln Park	16010	17016	17046	16987	16128	16837	16489
Livonia	27703	44087	44197	44560	34788	43359	42481
Melvindale	4399	4918	4754	4866	4178	4648	4976
Northville	1081	1309	1248	1345	926	1045	1348
Northville Twp.	1745	9426	13512	10387	7417	10276	9904
Plymouth	3762	4953	4999	4886	3884	4559	4870
Plymouth Twp.	4921	9520	11027	8999	8256	8839	9462
Redford Twp.	19773	20704	20198	21118	19275	20781	20773
River Rouge	5078	5257	3950	5258	4935	5257	5249
Riverview	2951	4810	6111	5067	4536	5025	4927
Rockwood	776	1914	1623	1580	1072	1543	1642
Romulus	6570	14698	15913	14172	12471	12995	14323
Southgate	9185	13492	12937	12686	11149	12502	12627
Sumpter Twp.	2175	7712	13278	8307	5816	7600	9288
Taylor	18523	35301	32988	32236	25258	31569	32102
Trenton	6572	8968	8879	8819	7710	8803	8823
Van Buren Twp.	3572	21007	21266	21965	15977	18416	21224
Wayne	5999	10038	8548	8562	7254	7892	8370
Westland	23022	40179	40253	38291	29990	38495	38518
Woodhaven	906	4487	4422	4120	3189	3899	4114
Wyandotte	12922	13258	12495	13134	10869	12206	13110
Addison Twp.	703	1555	1489	1527	7963	2253	1691
Avon Twp.	6044	20694	23302	14245	23024	20685	20516
Berkley	6726	5410	5595	5927	3795	4452	5860
Beverly Hills	3763	4081	4614	4029	3565	4256	4086
Bingham Farms	195	244	337	264	132	189	295
Birmingham	8645	8178	8512	8480	7138	7612	8332
Bloomfield Hills	1052	2183	5002	1699	2900	1658	2352
Bloomfield Twp.	11348	16995	20741	15286	15484	15638	16450
Brandon Twp.	1025	3289	2035	2094	7933	4957	5125
Clarkston	312	327	327	325	344	327	327
Clawson	4782	4732	4754	4704	3754	4576	4692
Commerce Twp.	3948	8862	9093	6795	10845	11373	10311
Farmington	3549	4839	4529	4626	2987	4395	4514
Farmington Hills	13745	22998	33049	23029	23179	23061	24825
Ferndale	10200	8776	8977	9282	6269	6972	9310
Franklin	875	1238	1586	1327	1130	1414	1367
Groveland Twp.	714	3157	1426	2240	3106	4124	1661
Hazel Park	7198	6471	6648	6803	4696	5289	6806
Highland Twp.	2301	6337	5707	6381	11150	8226	9467
Holly	1270	2220	1364	2029	1936	3789	1355
Holly Twp.	896	3155	1361	1835	9995	3552	1364
Huntington Woods	2407	2383	2383	2383	2326	2383	2383
Independence Twp.	4249	12457	11415	11901	12556	14118	12078
Keego Harbor	1001	1002	973	1088	730	795	1073

Continued

TABLE B-2(continued)

Minor Civil Division	1970 Base	Alternative 1	2	3	4	5	6
Lake Angelus	163	190	205	208	354	340	138
Lake Orion	921	1428	2005	1291	1454	1774	1393
Lathrup Village	1372	1673	1861	1672	1418	1674	1672
Leonard	96	163	138	127	524	177	146
Lyon Twp.	1347	6023	4093	5581	5380	8265	5382
Madison Heights	10970	13490	13301	12649	9730	12692	12844
Milford	1317	2111	3201	2069	2470	2138	2106
Milford Twp.	656	1687	1754	2220	4286	3066	1658
Northville (part)	548	1127	1130	1013	820	1104	1130
Novi	2692	14076	16671	12312	16831	14347	10867
Oakland Twp.	1202	4916	4151	4680	3210	9240	3402
Oak Park	10926	11752	10993	10995	8865	11756	10913
Orchard Lake	399	548	585	612	1312	1029	378
Orion Twp.	3782	10235	9683	6555	14575	14250	10332
Ortonville	255	294	300	298	561	332	295
Oxford	782	1048	2845	874	1030	997	982
Oxford Twp.	1637	4586	4803	5820	6173	9129	5154
Pleasant Ridge	1200	1200	1200	1200	1200	1200	1200
Pontiac	25524	26872	28724	27897	21132	24844	28818
Pontiac Twp.	3718	8872	10600	7942	7598	9413	8929
Rochester	2544	3084	3039	3090	3098	3001	2982
Rose Twp.	670	2295	1946	3083	4102	4337	2656
Royal Oak	27503	24927	23623	26090	19535	21935	25906
Royal Oak Twp.	2360	2653	2429	2714	2560	2714	2712
Southfield	20127	31927	33315	30858	28093	33376	31405
South Lyon	754	2147	2217	1922	2598	2160	2130
Springfield Twp.	1197	6207	5846	11385	4115	10826	5894
Sylvan Lake	682	726	766	733	582	551	727
Troy	12183	28327	32470	23904	24935	25778	26693
Walled Lake	1085	1385	1483	1297	3166	1927	1372
Waterford Twp.	16889	25542	27524	22219	25030	28802	25980
West Bloomfield Twp.	7351	16840	29927	15017	15182	17042	18462
White Lake Twp.	4013	11245	10749	11150	11490	13188	14097
Wixom	593	5361	6116	4501	5519	4164	2021
Wolverine Lake	1059	1350	1467	1327	1522	1482	1384
Armada	374	693	779	689	917	718	684
Armada Twp.	424	978	968	1281	7473	1267	687
Bruce Twp.	579	3069	2034	1726	5122	1588	2197
Centerline	3092	3265	3316	3270	3164	3353	3270
Chesterfield Twp.	[illegible]32	16540	22727	17941	11098	16467	17328
Clinton Twp.	13042	33211	34434	33859	22757	32080	32761
East Detroit	13077	12022	10767	12668	9235	10426	12640
Fraser	3008	5574	6025	5484	4776	5463	5467
Grosse Pointe Shores (pt)	54	82	82	82	82	82	82
Harrison Twp.	5530	12214	12988	12844	9680	12247	12353
Lenox Twp.	745	2901	3109	3558	4958	3461	3824
Macomb Twp.	1551	10684	6627	7773	7937	7095	6882
Memphis(pt)	217	747	1183	838	560	910	837
Mt. Clemens	6571	7172	6282	8117	7194	7850	7469
New Baltimore	1149	3534	3746	3345	4399	3208	3385
New Haven	520	1495	1737	1817	1220	1676	1695
Ray Twp.	708	1872	1722	3254	3945	3248	2351
Richmond	927	2153	3396	2140	1797	2135	2137
Richmond Twp.	426	1348	1107	1484	7417	1640	1207
Romeo	1156	1561	1215	1219	1214	1219	1219
Roseville	16463	19321	17343	19254	15682	17702	19272
Shelby Twp.	7402	24828	13517	25096	20911	23851	24368
Sterling Heights	16371	32374	38606	34005	23933	32410	32683
St. Clair Shores	24555	25502	23678	25881	22141	24415	25808
Utica	1149	1823	1879	1817	1960	1817	1454
Warren	48587	56831	57042	55530	46324	55148	54567
Washington Twp.	1494	9033	5746	11003	5846	10072	8246
Ann Arbor	32269	42218	44767	47962	35941	43778	45494
Ann Arbor Twp.	526	4467	2934	5178	3476	3218	4425
Agusta Twp.	1174	6339	3390	5728	3240	6929	7110
Bridgewater Twp.	306	890	404	633	10534	1229	989
Chelsea	1120	2085	2416	4894	1498	2427	2477
Dexter	492	594	647	611	588	641	603

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Continued

TABLE B-2(continued)

Minor Civil Division	1970 Base	Alternative					
		1	2	3	4	5	6
Dexter Twp.	622	1828	2144	1386	4453	4281	1681
Freedom Twp.	391	1291	490	865	19758	1568	1367
Lima Twp.	365	1215	592	1248	5703	2084	1331
Lodi Twp.	541	2067	1242	1885	3474	1769	2507
Lyndon Twp.	323	1288	526	984	1752	2170	1287
Manchester	534	1191	2602	1692	1354	1362	1102
Manchester Twp.	355	944	596	791	11010	1194	1153
Milan (part)	1052	1261	1276	1269	1258	1267	1267
Northfield Twp.	1201	3193	2888	5125	7177	5032	4468
Pittsfield Twp.	2844	9924	7833	10998	5916	10328	10678
Salem Twp.	849	2416	1752	2014	2363	2381	2008
Saline	1466	2956	3329	3856	2699	2999	2915
Saline Twp.	367	800	959	481	4182	1564	1281
Scio Twp.	1071	12946	4352	9361	6966	12723	14908
Sharon Twp.	232	1658	506	1281	12296	2275	1287
Superior Twp.	2763	2439	2070	2464	2500	2731	2648
Sylvan Twp.	503	1287	1526	1557	4100	1660	2335
Webster Twp.	853	1167	1282	750	5604	1663	1180
York Twp.	840	2896	1819	3534	7664	4626	4414
Ypsilanti	7737	10671	11752	11636	9843	10993	10463
Ypsilanti Twp.	7850	36068	41163	41681	24341	37873	31154
Ash Twp.	1165	5555	3524	5021	8038	5590	4435
Bedford Twp.	5574	20690	25596	21446	22977	17683	20906
Berlin Twp.	1025	5363	5112	6015	10728	5657	5199
Carlteon	403	932	717	943	814	960	943
Dundee	801	2197	294	2198	1318	2207	2201
Dundee Twp.	658	3548	2945	1339	6090	4389	2746
Erie Twp.	1238	6346	5568	6010	8107	6213	3762
Estral Beach	140	160	148	148	148	148	148
Exeter Twp.	634	1974	979	2393	2576	2036	2069
Frenchtown Twp.	4026	13476	12351	14271	17111	12139	12380
Ida Twp.	884	7112	1143	3750	3374	3921	4097
LaSalle Twp.	1106	4000	6211	2795	7622	5292	4088
London Twp.	671	2916	920	3808	5096	3823	2351
Luna Pier	419	441	441	441	860	947	432
Maybee	151	1171	154	833	558	1207	551
Milan (part)	234	244	339	297	244	244	251
Milan Twp.	520	2018	683	2220	4268	2794	2189
Monroe	6227	8883	8985	8904	10571	10441	8960
Monroe Twp.	3799	6046	7727	6520	7116	5888	6262
Petersburg	385	427	426	427	436	427	427
Raisinville Twp.	1044	5070	2209	3908	2955	3668	3527
South Rockwood	398	1310	1118	1532	1276	1416	1294
Summerfield Twp.	658	3124	2322	3851	4994	4830	3571
Whiteford Twp.	1073	6849	1465	4420	4663	4131	2785
Algonac	1164	2138	2230	2250	1568	2155	2196
Berlin Twp.	353	2133	695	883	12072	2385	1684
Brockway Twp.	286	1153	1311	1145	25132	1489	1332
Burtchville Twp.	580	2392	2430	1506	6376	2680	1858
Capac	403	1490	1562	1348	807	1344	1092
Casco Twp.	529	1817	1246	1169	13697	2010	1855
China Twp.	488	2514	725	1573	6483	2995	1463
Clay Twp.	2101	6054	6143	8288	16550	9652	8719
Clyde Twp.	1232	2034	2329	1667	5456	2390	1769
Columbus Twp.	526	2344	1598	1419	8082	2472	2167
Cottrellville Twp.	643	3114	1464	2235	7064	4047	2981
East China Twp.	665	2877	3250	4353	3350	4056	3383
Emmett	65	263	89	188	850	145	118
Emmett Twp.	210	1832	634	551	7832	2326	1570
Fort Gratiot Twp.	1737	5205	6434	8296	8919	6450	5045
Grant Twp.	228	921	413	491	6578	1018	1072
Greenwood Twp.	272	602	548	524	10386	806	688
Ira Twp.	1220	3765	5331	4830	5651	4341	4595
Kenockee Twp.	181	2754	713	713	16425	2330	1824

continued

TABLE B-2(continued)

Minor Civil Division	1970 Base	Alternative					
		1	2	3	4	5	6
Kimball Twp.	1661	7756	16643	7665	11110	8484	7868
Lynn Twp.	246	776	414	553	19800	816	922
Marine City	1417	2322	2457	2402	1771	2338	2103
Marysville	1679	3293	5450	3311	3502	3215	3488
Memphis (part)	81	323	508	326	483	575	338
Mussey Twp.	578	195	208	216	1262	944	222
Port Huron	12546	15246	14967	15836	12621	15339	15736
Port Huron Twp.	1571	6714	12618	7189	11994	7110	6607
Riley Twp.	320	2381	554	1772	9791	2317	1552
St. Clair	1518	2836	3854	3225	2134	3042	2913
St. Clair Twp.	943	3543	2327	3874	5290	4107	3290
Wales Twp.	230	3436	1651	850	10609	4092	2581
Yale	557	984	1390	984	837	1019	980
Brighton	806	3319	3799	3307	2237	3294	3294
Brighton Twp.	1691	5490	4179	7016	6151	9289	8061
Cohoctah Twp.	412	1482	688	905	4402	1791	1810
Conway Twp.	299	868	404	576	9998	1087	1160
Deerfield Twp.	374	2353	878	1688	6336	12433	3153
Fowlerville	645	911	1206	1048	1089	1020	850
Genoa Twp.	1448	5316	4232	6776	3374	8720	7574
Green Oak Twp.	2031	6204	3606	5701	8213	9841	9420
Hamburg Twp.	1609	5626	4216	5754	5874	7933	5665
Handy Twp.	449	1508	686	1234	2909	1750	1970
Hartland Twp.	748	2576	3171	4363	3693	8107	3171
Howell	1736	2353	2253	2616	2925	2576	2296
Howell Twp.	607	2631	1655	4189	3873	4450	3482
Iosco Twp.	192	536	326	652	4994	2915	704
Marion Twp.	626	3183	1196	2115	4287	8891	4211
Oceola Twp.	872	2369	1097	2179	9426	9123	2948
Pinckney	210	842	980	767	1306	993	799
Putnam Twp.	750	2327	1738	2561	4308	2715	4514
Tyrone Twp.	842	3172	1451	4256	3601	5978	3791
Unadilla Twp.	542	2170	1140	1558	2979	2593	2719

APPENDIX C

DETAILED TABLES

Many tables presented in the body of the report have been summarized for purposes of clarity. This appendix presents 18 additional tables in a more expanded format for those who wish additional detail.

TABLE C-1

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION
BY SEWER SERVICE PERIOD AND COUNTY
ALTERNATIVE 1
(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	64712	204417	50094	72336	55425	14243	14218	2125	477570
1975	0	29933	48231	45977	7003	19106	12680	3385	166315
1980	0	34380	47271	37473	62147	32306	12778	11076	237431
1990	0	32757	9495	43324	28	26364	10300	3136	125404
Sub Total Sewered	64712	301487	155091	199110	124603	92019	49976	19722	1006720
Never Sewered	0	2104	84862	8465	57519	42262	33059	97279	325550
TOTAL	64712	303591	239953	207575	182122	134281	83035	117001	1332270

TABLE C-2

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION
BY SEWER SERVICE PERIOD AND COUNTY
ALTERNATIVE 2
(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	69079	226162	190659	98615	98188	30662	23964	3929	741258
1975	0	71652	61413	66850	13160	31846	23152	3397	271468
1980	0	16434	10017	0	4763	21270	30760	8558	91802
1990	0	0	0	0	0	0	0	0	0
Sub Total Sewered	69079	314248	262089	165465	116111	83778	77876	15884	1104528
Never Sewered	0	187	61697	8388	837	1537	8242	4570	85458
TOTAL	69079	314435	323786	173853	116948	85315	86118	20454	1189986

TABLE C-3

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION
BY SEWER SERVICE PERIOD AND COUNTY
ALTERNATIVE 3
(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	64186	157594	29557	62217	75759	14372	17419	2405	423509
1975	0	19241	29640	42301	62753	16610	16064	2388	188997
1980	0	32774	28590	27641	36497	8115	12426	7548	153591
1990	0	27777	5079	55133	18991	15190	20272	6295	148737
Sub Total Sewered	64186	237386	92866	187292	194000	54287	66181	18636	914834
Never Sewered	0	2039	48855	9947	16189	29413	6102	22068	134613
TOTAL	64186	239425	141721	197239	210189	83700	72283	40704	1049447

TABLE C-4

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION
BY SEWER SERVICE PERIOD AND COUNTY
ALTERNATIVE 4
(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	58041	235801	100669	101613	110511	33585	26097	2778	669095
1975	0	243497	1355962	685886	1616117	1328684	1699807	1402114	8332067
1980	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0
Sub Total Sewered	58041	479298	1456631	787499	1726628	1362269	1725904	1404892	9001162
Never Sewered	0	0	0	0	0	0	0	0	0
TOTAL	58041	479298	1456631	787499	1726628	1362269	1725904	1404892	9001162

TABLE C-5

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION
BY SEWER SERVICE PERIOD AND COUNTY
ALTERNATIVE 5
(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	65068	157887	48277	62060	70525	15749	13978	2046	435590
1975	0	19604	45989	42586	36109	19233	14566	2845	180932
1980	0	33014	41153	27117	20972	9834	12405	11470	155965
1990	0	27883	80064	55269	14088	20044	42577	32702	272627
Sub Total Sewered	65068	238388	215483	187032	141694	64860	83526	49063	1045114
Never Sewered	0	2007	80042	9902	65425	36060	37567	120720	351723
TOTAL	65068	240395	295525	196934	207119	100920	121093	169783	1396837

TABLE C-6

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COUNTY ALTERNATIVE 6

(IN DWELLING UNITS)

Sewer Service Period	Detroit	Out-Wayne	Oakland	Macomb	Washtenaw	Monroe	St. Clair	Livingston	Region
1970	64995	154728	43648	61201	48726	14488	13414	2146	403346
1975	0	19408	42885	42455	36566	17198	13211	2703	174426
1980	0	36691	41377	23253	25197	14188	8811	11282	160799
1990	0	0	0	0	0	0	0	0	0
Sub Total Sewered	64995	210827	127910	126909	110489	45874	35436	16131	738571
Never Sewered	0	3008	94343	10537	38613	21732	25088	85229	278550
TOTAL	64995	213835	222253	137446	149102	67606	60524	101360	1017121

TABLE C-7

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 1

(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	94960	117924	2271	39446	131690	1096	90184	477571
1975	55	36866	21	10466	63204	4238	51466	166316
1980	636	13474	8	16438	61732	32320	112823	237431
1990	684	1511	8	3581	24237	22740	72642	125403
Sub Total Sewered	96335	169775	2308	69931	280863	60394	327115	1006721
Never Sewered	70	292	1	4443	25173	233220	62351	325550
TOTAL	96405	170067	2309	74374	306036	393614	389466	1332271

TABLE C-8

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 2

(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	95867	190414	3189	72576	245415	2994	130805	741260
1975	1952	37322	32	17175	98860	616	115513	271470
1980	0	1368	0	0	8892	47754	33788	91802
1990	0	0	0	0	0	0	0	0
Sub Total Sewered	97819	229104	3221	89751	353167	51364	280106	1104532
Never Sewered	92	938	2	2742	14750	52035	14899	85458
TOTAL	97911	230042	3223	92493	367917	103399	295005	1189990

TABLE C-9

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 3

(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	86812	94633	2048	33033	123496	697	82790	423509
1975	0	31133	270	9674	54718	1541	91661	188997
1980	620	8826	8	10301	45939	10765	77131	153590
1990	668	1754	8	2389	26922	26126	90870	148737
Sub Total Sewered	88100	136346	2334	55397	251075	39129	342452	914833
Never Sewered	60	425	1	3393	14037	83901	32796	134613
TOTAL	88160	136771	2335	58790	265112	123030	375248	1049446

TABLE C-10

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 4
(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	86401	156721	4403	61751	212214	3534	144072	669096
1975	2864	117943	606	100908	719330	5386318	2004096	8332065
1980	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0
Sub Total Sewered	89265	274664	5009	162659	931544	5389852	2148168	9001161
Never Sewered	0	0	0	0	0	0	0	0
TOTAL	89265	274664	5009	162659	931544	5389852	2148168	9001161

TABLE C-11

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 5

(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	87827	96214	2444	34021	130154	1592	83337	435589
1975	0	33810	0	7256	61331	1889	76646	180932
1980	640	11300	8	10196	52969	11755	69097	155965
1990	688	2173	278	6306	57189	78030	127961	272625
Sub Total Sewered	89155	143497	2730	57779	301643	93266	357041	1045111
Never Sewered	72	148	1	5471	16634	261421	67976	351723
TOTAL	89227	143645	2731	63250	318277	354687	425017	1396834

TABLE C-12

PLANNED RESIDENTIAL HOLDING CAPACITY EXPANSION BY SEWER SERVICE PERIOD AND COMMUNITY GROUP FOR ALTERNATIVE 6
(IN DWELLING UNITS)

Sewer Service Period	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Region
1970	87421	94692	2102	29971	112678	908	75575	403347
1975	0	33022	0	7320	59576	899	73609	174426
1980	952	10462	16	9167	51872	21673	66655	160797
1990	0	0	0	0	0	0	0	0
Sub Total Sewered	88373	138176	2118	46458	224126	23480	215839	738570
Never Sewered	62	279	8	5096	23764	191095	58244	278548
TOTAL	88435	138455	2126	51554	247890	214575	274083	1017118

TABLE C-13

YEAR 2000 PERCENTAGE DISTRIBUTION OF SCHOOL-AGE CHILDREN BY COUNTY

County	Alternative						
	1970 Base	1	2	3	4	5	6
Detroit	28.35	18.46	18.01	19.74	11.19	15.67	19.51
Out-Wayne	25.76	23.37	23.32	23.02	16.68	21.15	22.51
Oakland	20.03	20.47	23.56	19.55	19.45	22.07	20.78
Macomb	14.51	14.18	14.18	14.57	11.59	13.18	13.68
Washtenaw	4.61	8.36	7.56	9.21	11.50	9.24	8.81
Monroe	2.74	6.49	5.48	5.96	7.74	5.95	4.97
St. Clair	2.61	4.95	5.21	4.58	15.87	5.55	4.76
Livingston	1.38	3.73	2.69	3.37	5.97	7.20	4.98
REGION	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE C-14

YEAR 2000 PERCENTAGE DISTRIBUTION OF SCHOOL-AGE CHILDREN BY COMMUNITY GROUP

Community Group	Alternative						
	1970 Base	1	2	3	4	5	6
Group 1	55.40	35.18	34.62	36.86	22.88	31.05	36.32
Group 2	18.57	16.89	17.89	16.95	12.24	16.14	16.88
Group 3	2.16	1.53	1.51	1.57	1.21	1.58	1.59
Group 4	4.04	5.38	6.22	5.27	4.61	5.14	4.84
Group 5	12.50	17.67	20.41	17.04	15.70	16.82	17.16
Group 6	3.61	11.00	7.91	9.37	29.50	15.89	10.56
Group 7	3.72	12.35	11.34	12.94	13.87	13.37	12.66
REGION	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE C-15

1970 SEWERED AND NON-SEWERED SENSITIVE LAND CONVERTED BY YEAR 2000 BY COUNTY (IN ACRES)

County Land Type	Sewer Status	Alternative 1	2	3	4	5	6
Detroit							
Water-Related	Sewered	0	0	0	0	0	0
	Non-Sewered	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Other Sensitive	Sewered	0	0	0	0	0	0
	Non-Sewered	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Agriculture	Sewered	0	0	0	0	0	0
	Non-Sewered	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Total	Sewered	0	0	0	0	0	0
	Non-Sewered	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Out-Wayne							
Water-Related	Sewered	326	355	1143	622	1011	387
	Non-Sewered	82	88	60	46	66	105
	Total	408	443	1203	668	1077	492
Other Sensitive	Sewered	6155	4544	5971	3224	5293	5679
	Non-Sewered	767	568	975	419	864	863
	Total	6922	5112	6946	3643	6157	6542
Agriculture	Sewered	22083	17211	20580	11813	18384	20944
	Non-Sewered	5785	3375	6733	3036	6203	6443
	Total	27868	20586	27313	14849	24587	27387
Total	Sewered	28564	22110	27694	15659	24688	27010
	Non-Sewered	6634	4031	7768	3501	7133	7411
	Total	35198	26141	35462	19160	31821	34421
Oakland							
Water-Related	Sewered	336	393	310	4420	6669	387
	Non-Sewered	2014	2125	1253	1339	8926	1663
	Total	2350	2518	1563	5759	15595	2050
Other Sensitive	Sewered	8141	8979	6802	6125	9211	8823
	Non-Sewered	13407	5588	19801	5368	17194	11987
	Total	21548	14567	26603	11493	26405	20810
Agriculture	Sewered	4240	3456	880	8781	5691	4368
	Non-Sewered	33006	8788	9826	8913	50939	31084
	Total	37246	12244	10706	17694	56630	35452
Total	Sewered	12717	12828	7992	19326	21571	13578
	Non-Sewered	48427	16501	30880	15620	77059	44734
	Total	61144	29329	38872	34946	98630	58312

continued

TABLE C-15 (continued)

County Land Type	Sewer Status	Alternative					
		1	2	3	4	5	6
Macomb							
Water-Related	Sewered	101	120	1149	888	1052	107
	Non-Sewered	166	180	359	115	377	292
	Total	267	300	1508	1003	1429	399
Other Sensitive	Sewered	1138	590	1266	794	1129	1195
	Non-Sewered	820	444	1073	418	1040	866
	Total	1958	1034	2339	1212	2169	2061
Agriculture	Sewered	7493	4739	8413	6793	7511	7874
	Non-Sewered	6126	2444	7095	2515	7355	6791
	Total	13619	7183	15508	9308	14866	14665
Total	Sewered	8732	5449	10828	8475	9692	9176
	Non-Sewered	7112	3068	8527	3048	8772	7949
	Total	15844	8517	19355	11523	18464	17125
Washtenaw							
Water Related	Sewered	185	117	421	743	553	221
	Non-Sewered	70	33	401	51	848	78
	Total	255	150	822	794	1401	299
Other Sensitive	Sewered	1711	881	1358	2870	1838	1983
	Non-Sewered	3524	682	3017	505	4724	3396
	Total	5235	1563	4375	3375	6562	5379
Agriculture	Sewered	14484	10241	13382	18486	15578	16339
	Non-Sewered	23362	5042	17994	3473	33591	24147
	Total	37846	15283	31376	21959	49169	40486
Total	Sewered	16380	11239	15161	22099	17969	18543
	Non-Sewered	26956	5757	21412	4029	39163	27621
	Total	43336	16996	36573	26128	57132	46164
Monroe							
Water-Related	Sewered	0	0	0	2580	2598	0
	Non-Sewered	834	850	284	787	5823	869
	Total	834	850	284	3367	8421	869
Other Sensitive	Sewered	2220	1323	1941	1295	1584	1871
	Non-Sewered	3778	492	4668	370	4728	3489
	Total	5998	1815	6609	1665	6312	5360
Agriculture	Sewered	18115	7739	12793	12466	11795	12571
	Non-Sewered	35400	5381	45072	4009	45217	32223
	Total	53515	13120	57865	16475	57012	44794
Total	Sewered	20335	9062	14734	16341	15977	14442
	Non-Sewered	40012	6723	50024	5166	55768	36581
	Total	60347	15785	64758	21507	71745	51023

continued

TABLE C-15 (continued)

County Land Type	Sewer Status	Alternative 1	2	3	4	5	6
St. Clair							
Water-Related	Sewered	594	477	856	2466	1323	659
	Non-Sewered	150	89	101	112	1198	127
	Total	744	566	957	2578	2521	786
Other Sensitive	Sewered	1430	1334	1991	3499	1704	872
	Non-Sewered	3830	874	2060	666	4763	3137
	Total	5260	2208	4051	4165	6467	4009
Agriculture	Sewered	4591	2990	4936	22349	4604	2302
	Non-Sewered	24802	3215	12232	2448	32052	22764
	Total	29393	6205	17168	24797	36656	25066
Total	Sewered	6651	4801	7783	28314	7631	3833
	Non-Sewered	28782	4178	14393	3226	38013	26028
	Total	35397	8979	22176	31540	45644	29861
Livingston							
Water Related	Sewered	0	0	0	1407	1747	0
	Non-Sewered	336	294	64	188	3630	280
	Total	336	294	64	1595	5377	280
Other Sensitive	Sewered	1378	716	1862	2849	3155	2093
	Non-Sewered	9600	2473	773	1645	23033	10987
	Total	10978	3189	2635	4494	26188	13080
Agriculture	Sewered	1241	849	1718	5925	3615	2295
	Non-Sewered	22213	5353	26362	3632	55800	30807
	Total	23454	6202	28080	9557	59415	33102
Total	Sewered	2619	1565	3580	10181	8517	4388
	Non-Sewered	32149	8120	27199	5465	82463	42074
	Total	34768	9685	30779	15646	90980	46462
Region							
Water-Related	Sewered	1542	1462	3879	13126	14953	1761
	Non-Sewered	3652	3659	2522	2638	20868	3414
	Total	5194	5121	6401	15764	35821	5175
Other Sensitive	Sewered	22173	18367	21191	20656	23914	22516
	Non-Sewered	35726	11121	32367	9391	56346	34725
	Total	57899	29488	53558	30047	80260	57241
Agriculture	Sewered	72247	47225	62702	86613	67178	66693
	Non-Sewered	150694	33598	125314	28026	231157	154259
	Total	222941	80823	188016	114639	298335	220952
Total	Sewered	95962	67054	87772	120395	106045	90970
	Non-Sewered	190072	48378	160203	40055	308371	192398
	Total	286034	115432	247975	160450	414416	283368

TABLE C-16

1970 SEWERED AND NON-SEWERED SENSITIVE LAND CONVERTED BY YEAR 2000 BY COMMUNITY GROUP (IN ACRES)

Community Group Land Type	Sewer Status	Alternative 1	2	3	4	5	6
Group 1							
Water-Related	Sewered	21	24	213	136	201	28
	Non-Sewered	10	6	0	0	0	11
	Total	31	30	213	136	201	39
Other Sensitive	Sewered	395	321	322	244	302	318
	Non-Sewered	0	0	0	0	0	0
	Total	395	321	322	244	302	318
Agriculture	Sewered	452	452	474	390	409	471
	Non-Sewered	1	0	0	0	0	0
	Total	453	452	474	390	409	471
Total	Sewered	868	797	1009	770	912	817
	Non-Sewered	11	6	0	0	0	11
	Total	879	803	1009	770	912	828
Group 2							
Water-Related	Sewered	84	80	400	1300	1629	126
	Non-Sewered	388	789	91	226	428	361
	Total	472	869	491	1526	2057	487
Other Sensitive	Sewered	5719	5478	4829	3136	5351	5625
	Non-Sewered	1519	777	1718	1334	1419	1430
	Total	7238	6255	6547	4470	6770	7055
Agriculture	Sewered	5628	4480	5196	3071	5015	5795
	Non-Sewered	712	450	494	611	621	582
	Total	6340	4930	5690	3682	5636	6377
Total	Sewered	11431	10038	10425	7507	11995	11546
	Non-Sewered	2619	2016	2303	2171	2468	2373
	Total	14050	12054	12728	9678	14463	13919
Group 3							
Water-Related	Sewered	0	0	7	55	162	0
	Non-Sewered	7	0	13	0	0	7
	Total	7	0	20	55	162	7
Other Sensitive	Sewered	168	158	172	75	162	167
	Non-Sewered	41	19	15	15	18	18
	Total	209	177	187	90	180	185
Agriculture	Sewered	74	89	142	134	131	74
	Non-Sewered	215	187	148	148	158	185
	Total	289	276	290	282	289	259
Total	Sewered	242	247	321	264	455	241
	Non-Sewered	263	206	176	163	176	210
	Total	505	453	497	427	631	451

continued

TABLE C-16 (continued)

Community Group Land Type	Sewer Status	Alternative 1	2	3	4	5	6
Group 4							
Water-Related	Sewered	156	187	365	1294	1684	147
	Non-Sewered	331	432	171	205	1177	371
	Total	487	619	536	1499	2861	518
Other Sensitive	Sewered	2343	2524	2639	1585	2498	2210
	Non-Sewered	1771	1023	1951	823	2070	1532
	Total	4114	3547	4590	2408	4568	3742
Agriculture	Sewered	7772	6378	6902	4614	6714	6698
	Non-Sewered	5666	2414	3016	2103	5991	4931
	Total	13438	8792	9918	6717	12705	11629
Total	Sewered	10271	9089	9906	7493	10896	9055
	Non-Sewered	7768	3869	5138	3131	9238	6834
	Total	18039	12958	15044	10624	20134	15889
Group 5							
Water-Related	Sewered	586	579	1319	3517	6183	679
	Non-Sewered	1586	1460	908	1166	4037	1410
	Total	2172	2039	2227	4683	10220	2089
Other Sensitive	Sewered	6912	5717	5848	4185	7125	7411
	Non-Sewered	7818	3618	8443	3125	7109	7578
	Total	14730	9335	14291	7310	14234	14989
Agriculture	Sewered	27001	19079	22498	16734	24537	25949
	Non-Sewered	21142	8180	12121	8186	21199	21513
	Total	48143	27259	34619	24920	45736	47462
Total	Sewered	34499	25375	29665	24436	37845	34039
	Non-Sewered	30546	13258	21472	12477	32345	30501
	Total	65045	38633	51137	36913	70190	64540
Group 6							
Water-Related	Sewered	32	23	22	3884	2186	27
	Non-Sewered	863	607	648	654	11954	759
	Total	895	630	670	4538	14140	786
Other Sensitive	Sewered	1305	1152	1481	6974	2236	740
	Non-Sewered	17348	3371	14549	2322	36260	16509
	Total	18653	4523	16030	9296	38496	17249
Agriculture	Sewered	9913	4184	5607	42847	8386	4361
	Non-Sewered	89893	13582	76611	9787	157382	90545
	Total	99806	17766	82218	52634	165768	94906
Total	Sewered	11250	5359	7110	53705	12808	5128
	Non-Sewered	108104	17560	91808	12763	205596	107813
	Total	119354	22919	98918	66468	218404	112941

continued

TABLE C-16 (continued)

Community Group Land Type	Sewer Status	Alternative 1	2	3	4	5	6
Group 7							
Water-Related	Sewered	663	569	1553	2940	2908	754
	Non-Sewered	467	365	691	387	3272	495
	Total	1130	934	2244	3327	6180	1249
Other Sensitive	Sewered	5331	3017	5900	4457	6240	6045
	Non-Sewered	7229	2313	5691	1772	9470	7658
	Total	12560	5330	11591	6229	15710	13703
Agriculture	Sewered	21407	12563	21883	18823	21986	23345
	Non-Sewered	33065	8785	32924	7191	45806	36503
	Total	54472	21348	54807	26014	67792	59848
Total	Sewered	27401	16149	29336	26220	31134	30144
	Non-Sewered	40761	11463	39306	9350	58548	44656
	Total	68162	27612	68642	35570	89682	74800
Region							
Water-Related	Sewered	1542	1462	3879	13126	14953	1761
	Non-Sewered	3652	3659	2522	2638	20868	3414
	Total	5194	5121	6401	15764	35821	5175
Other Sensitive	Sewered	22173	18367	21191	20656	23914	22516
	Non-Sewered	35726	11121	32367	9391	56346	34725
	Total	57899	29488	53558	30047	80260	57241
Agriculture	Sewered	72247	47225	62702	86613	67178	66693
	Non-Sewered	150694	33598	125314	28026	231157	154259
	Total	222941	80823	188016	114639	298335	220952
Total	Sewered	95962	67054	87772	120395	106045	90970
	Non-Sewered	190072	48378	160203	40055	308371	192398
	Total	286034	115432	247975	160450	414416	283368

TABLE C-17

PRIVATE CAPITAL COSTS PER NEW DWELLING UNIT

BY COUNTY (In Dollars)

County	Type	Alternative					
		1	2	3	4	5	6
Detroit	Sewers	372.31	335.39	378.27	527.34	341.86	372.14
	Water Mains	220.68	197.45	223.61	317.47	200.92	219.92
	Roads	990.82	889.88	1007.81	1424.18	904.83	990.80
	Total	1583.81	1422.72	1609.69	2268.99	1447.61	1582.86
Out-Wayne	Sewers	961.54	601.37	938.27	662.17	942.61	941.20
	Water Mains	593.19	366.97	576.57	404.72	579.17	580.75
	Roads	1700.69	1513.11	1616.85	1610.73	1577.41	1613.60
	Total	3255.42	2481.45	3131.69	2677.62	3099.19	3135.55
Oakland	Sewers	882.30	525.39	742.39	591.62	859.54	900.83
	Water Mains	583.08	328.40	486.48	365.46	564.43	598.65
	Roads	3926.01	2730.68	3881.46	2310.95	4043.72	4237.31
	Total	5391.39	3584.47	5110.33	3268.03	5467.69	5736.79
Macomb	Sewers	1156.77	638.51	1110.86	684.69	1100.25	1157.92
	Water Mains	733.95	388.96	700.54	416.79	694.48	738.45
	Roads	2527.14	2018.72	2392.12	1927.59	2421.81	2621.85
	Total	4417.86	3046.19	4203.52	3029.07	4216.54	4518.22
Washtenaw	Sewers	920.54	576.45	629.91	608.16	850.66	989.02
	Water Mains	592.99	352.14	384.98	372.32	539.38	636.63
	Roads	3339.64	1772.83	2060.42	1746.63	3231.48	3393.84
	Total	4853.17	2701.42	3075.31	2727.11	4621.52	5019.49
Monroe	Sewers	1245.49	562.45	1078.15	585.56	1041.17	1143.05
	Water Mains	851.91	343.79	702.45	358.06	674.88	752.05
	Roads	4642.50	1971.18	3830.03	1817.55	3842.08	4126.16
	Total	6739.90	2877.42	5610.63	2761.17	5558.13	6021.26
St. Clair	Sewers	953.44	608.84	1092.01	585.56	897.52	828.97
	Water Mains	627.30	370.80	713.77	357.29	579.92	529.20
	Roads	3189.50	2379.34	2874.21	1638.73	3019.75	3053.04
	Total	4770.24	3358.98	4679.99	2581.58	4497.19	4411.21
Livingston	Sewers	346.44	301.30	434.96	548.32	377.25	387.92
	Water Mains	228.59	183.68	285.38	334.55	253.74	261.60
	Roads	3983.43	3387.38	4315.63	1954.33	4252.82	5455.01
	Total	4558.46	3872.36	5035.97	2837.20	4883.81	6104.53

TABLE C-18

PRIVATE CAPITAL COSTS PER NEW DWELLING UNIT
BY COMMUNITY GROUP (IN DOLLARS)

Community Group	Type	Alternative 1	2	3	4	5	6
Group 1	Sewers	528.13	411.71	476.56	563.52	474.20	465.50
	Water Mains	318.28	246.91	285.42	342.71	283.96	278.53
	Roads	1244.89	1148.64	1172.96	1656.71	1148.81	1152.85
	Total	2091.30	1807.26	1934.94	2562.94	1906.97	1896.88
Group 2	Sewers	1150.18	689.80	1055.67	756.76	1126.90	1145.63
	Water Mains	732.95	427.82	665.99	466.84	715.33	730.22
	Roads	2551.90	1869.82	2311.49	2097.18	2515.21	2541.25
	Total	4435.03	2987.44	4033.15	3320.78	4357.44	4417.10
Group 3	Sewers	799.01	525.88	809.52	584.54	888.52	733.23
	Water Mains	496.28	318.84	500.00	356.67	555.03	454.23
	Roads	1880.89	1523.81	1859.52	1875.83	2124.82	1694.72
	Total	3176.18	2368.53	3169.04	2817.04	3568.37	2882.18
Group 4	Sewers	1061.21	609.96	972.65	649.02	1015.92	1083.28
	Water Mains	671.12	372.30	610.16	395.81	636.28	685.74
	Roads	2989.17	1895.10	2676.96	1878.01	2827.44	3087.67
	Total	4721.50	2877.36	4259.77	2922.84	4479.64	4856.69
Group 5	Sewers	1085.78	571.38	967.29	615.00	1094.44	1109.20
	Water Mains	702.59	350.41	615.33	377.68	704.43	718.35
	Roads	3121.44	2092.23	2693.75	2043.20	3190.85	3198.68
	Total	4909.81	3014.02	4276.37	3035.88	4989.72	5026.23
Group 6	Sewers	501.41	297.65	380.20	571.51	340.46	272.53
	Water Mains	349.56	181.61	252.20	348.71	225.83	193.45
	Roads	4290.00	3559.74	3971.31	1751.92	3959.85	4778.68
	Total	5140.97	4039.00	4603.71	2672.14	4526.14	5244.66
Group 7	Sewers	1010.79	522.07	950.04	581.88	974.56	1022.36
	Water Mains	652.20	318.64	602.72	355.72	621.71	659.50
	Roads	3065.22	1923.04	2771.80	1795.40	3149.93	3297.35
	Total	4728.21	2763.75	4324.56	2733.00	4746.20	4979.21

GLOSSARY

GLOSSARY

Base Data	Information for 1970 used as input into the model. Much of the Base Data was obtained from U. S. Bureau of Census computer tapes.
Coding	The translation of information or data into numeric quantities suitable for computer input.
Control Totals	See regional forecasts.
Employment Capacity	The number of employees that a parcel of vacant land can accommodate, calculated by multiplying the available acres by the average number of employees per acre required for each industrial classification.
Feedback Mechanism	A process where activity in one sector influences activity in another. Activity in the second sector then "feeds back", or modifies, the first sector, thereby modifying its influence on the second sector.
Forecasts	Future values of something that are not related exclusively to past performance, but also to interrelationships with other events or things.
Forecast Period	As generally used here, one of the 5-year time spans covered by one run of the model. Six of these are used to cover the 30-year forecast interval.
Holding Capacity	The number of new dwelling units that a parcel of vacant land can accommodate, calculated by multiplying the available acres by the maximum allowable density.
Household Capacity	See holding capacity.
Mode	The type of vehicle a trip is made in. The two primary modes are private automobile and mass transit vehicles, e.g. buses and trains.
Model	In this context, a mathematical representation of some aspect of reality which allows events to be tested before they occur.
National Forecast	Forecasts of national industrial output, demographic patterns, and economic trends. The national forecasting model used here was developed by Dr. Clopper Almon, from the University of Maryland.

Projections	Future values of something, based exclusively on its past performance; that is, a projection is an extrapolation of past trends.
Regional Forecasts	Forecasts of regional totals of industrial output, population, households, and employment. The regional forecasting model used here was developed by Dr. Curtis Harris, Jr., from the University of Maryland.
Sensitive Land	Land types which are easily, and often permanently, disrupted by human activity.
Vehicle Miles Travelled (VMT)	One VMT is one vehicle travelling one mile.

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